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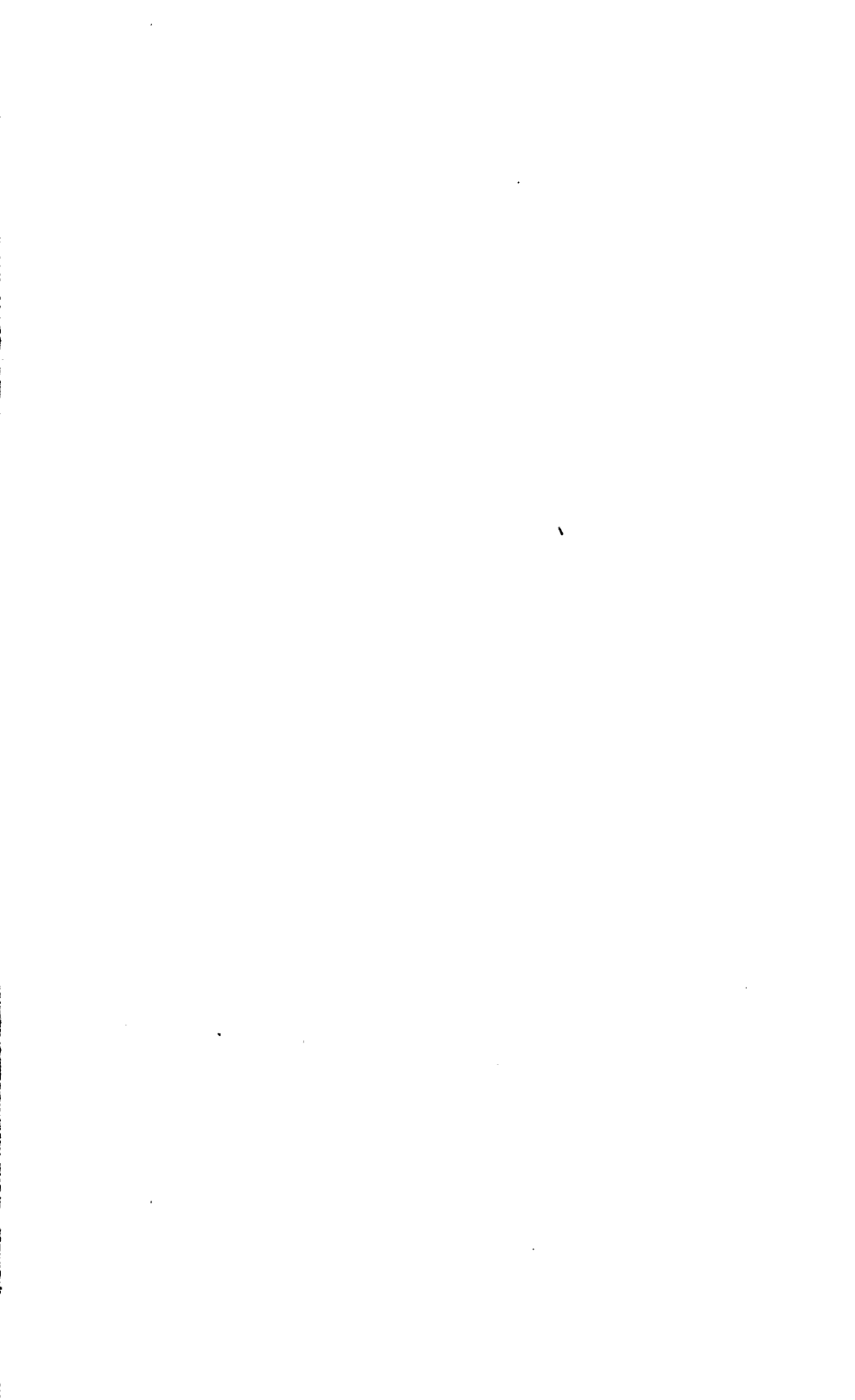
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FROM THE COLLECTION OF  
THE NATURAL HISTORY SOCIETY

April, 1893.

THE  
OTTAWA NATURALIST.

VOLUME VII. No. 1.

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THE BEAVER (*Castor Canadensis*, Kuhl).

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PAYNTER & CO., PRINTERS, 48 RIDEAU STREET.

Issued March 31st, 1893.

Published Monthly at \$1.00 per annum.

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1893

VOL. VII.

1894

THE  
OTTAWA NATURALIST.

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BEING VOL. IX OF THE

TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB.

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*(Organized March, 1879. Incorporated March, 1884.)*

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CONSTITUTION.  
OF THE  
OTTAWA FIELD NATURALISTS' CLUB.

---

1. *Name and Object.*—This Club shall be called the Ottawa Field-Naturalists' Club, and its object shall be the study of the Natural History of this Locality.

2. *Officers.*—The Officers of the Club shall consist of a President, first and second Vice-Presidents, a Secretary, a Treasurer, and a Librarian, who, together with six other members of the Club, of whom three shall be ladies, shall form a Council, all of whom shall be elected annually, and shall be eligible for re-election, and who shall have the management of all the business of the Club. In the event of any vacancy occurring in the Council during the year, the same may be filled by the election of a successor at any of its regular meetings.

3. *Auditors.*—There shall be two Auditors, elected annually, to examine the Treasurer's accounts for the following year, and report thereon at the next annual meeting.

4. *President and Vice-Presidents.*—The President shall direct all the business of the Club, and preside at all meetings of the Club and Council ; his duties, in the event of his absence, devolving on the Vice-Presidents in their order.

5. *Secretary.*—The Secretary shall give previous notice to each member of the Club of every meeting of the Club, and to each member of the Council of every meeting of the Council ; shall make and keep a true record of the Proceedings of all Meetings of the Club and of the Council : have custody of the Constitution, By-laws, and Records of the Club, and conduct its general correspondence.

6. *Treasurer.*—The Treasurer shall be charged with the collection and custody of the funds of the Club, and keep a regular account thereof, which shall always be open to the inspection of the Council.

He shall also submit at each annual meeting a statement showing the financial condition of the Club.

7. *Librarian.*—The Librarian shall have charge of all publications of the Club, and shall distribute the same under the direction of the Council. He shall also have the custody of all books and papers belonging to the Club, and shall supervise their circulation among the members.

8. *Council.*—The Council shall, as business may require, meet from time to time at the call of the President, or of any two officers; shall control all matters affecting the welfare of the Club, subject to this Constitution; shall have full control of the funds of the Club, and shall report its proceedings to the members at the Annual Meeting.

9. *Annual Meeting.*—The Annual Meeting of the Club shall be held on the Third Tuesday in March, at which, in addition to other business, the Annual Report of the Council shall be read, and the Council and Auditors for the following year elected, by ballot after nomination, by a majority of the members present.

10. *Special Meetings.*—A Special General Meeting of the Club may be called by the Council; and shall be called on requisition of not less than ten members, specifying the business they wish brought before the meeting. The Council shall call the meeting within fourteen days from the receipt of the requisition, giving one week's notice. No other business shall be transacted than that mentioned in the notice.

11. *Conduct of Meetings.*—The presence of ten members shall be required to constitute any general meeting of the Club, and of three members to constitute a meeting of the Council. All meetings shall be conducted under such by-laws and rules of procedure as may from time to time be adopted.

12. *Proceedings.*—Excursions in summer, and Evening Meetings and Classes of Instruction in winter, shall be held, and the Transactions of the Club shall be periodically published; all arrangements for which shall be made by the Council.

13. *Members.*—Any lady or gentleman desiring to join the Club shall send a written application, signed by the applicant and endorsed

by the recommendation of two members, to the Secretary, and if approved shall be elected at the next meeting of the Council. Members desiring to leave the Club must previously settle all dues and signify their intention in writing to the Secretary.

14. *Corresponding Members.*—The Council shall have the power of electing Corresponding Members, who shall be persons not residing in Ottawa or its immediate vicinity, but who may be desirous of promoting the objects of the Club. Corresponding Members shall not be required to pay membership fees.

15. *Annual Fee.*—The annual membership fee shall be one dollar, payable in advance, due on the third Tuesday in March, and no member in arrears shall be entitled to any of the privileges of the Club. New members to pay the fee for the current year upon election. The payment of the annual fee to entitle a member to receive a copy of the Transactions, as published, and to admission to the Club Soirées, without further charge.

16. *Amendments.*—This Constitution may not be changed or amended except by a special meeting of the Club called for that purpose, and by a two-third vote of the members present.



## EDITORIAL.

At the Annual Meeting, held on Tuesday, March 21st, Dr. Geo. Dawson was re-elected President of the Club. During the past year his connection with the important Behring Sea Arbitration caused him to be absent from Ottawa for much of the time, but as a satisfactory termination of this question may soon be expected, his presence with us this year will be more assured, and his interest in the success of the Club is such that he will be able to materially promote its welfare. All the old officers were re-elected except three, who are replaced by Mr. W. F. Ferrier, Miss A. Shenick and Miss A. M. Living. The attention of members is requested to the announcement on a previous page, of the Standing Committees, Editorial Staff and Leaders, whom the Council has appointed for the carrying on of the various departments of the Club's work. The former Editor, Mr. Fletcher, has been forced through pressure of work, and the distance from the city of his office, to resign his post, but he has promised his assistance to the incomer, and the Council has granted further aid by the appointment of Sub-Editors for the several branches of the scientific work of the Club. The start made in this direction during the past year, and the notes so published have proved acceptable to the members, but they should bear in mind that to make this section of the magazine really valuable and interesting, it will be necessary for each to make records and furnish notes to the sub-editors. The Council, in response to frequent enquiries, has authorized the re-printing of the Constitution, the only amendment to which, since its adoption at the Special Meeting, held March 28th, 1884, was made at the Annual Meeting in March, 1890, when the number of members in the Committee, of Council was enlarged from three to six, in order to specially provide for three ladies. Although the scope of the Club's work has been gradually widened to receive the benefits of investigations made by its members wherever they may be located, the special work for which it was organized must still merit the chief attention, and although much has been observed and recorded of the Natural History of Ottawa, there still remains vastly more to be done. The season for out-door work and study is here ; the snow and ice are melting, the birds are arriving, the

sap is commencing to revivify vegetation, the insects are crawling from their hibernating crevices ; a few days more and all nature will feel the rapid throbs of a new season of growth and development. Let us take every advantage of this finest season of the year, and leave cabinet and book-study to be true Field-Naturalists.

## ANNUAL REPORT OF THE COUNCIL, 1892-93.

### *To the Members of the Ottawa Field-Naturalists' Club :*

In presenting this, the *fourteenth* Annual Report of the work of the Club, your Council has much pleasure in stating that continued interest exists, and a large amount of valuable work has been accomplished. The growing interest which the public of Ottawa is taking in the excursions and soireés of the Club is very manifest, judging from the attendance on these occasions, as also from requests for admission to our membership.

One of the first duties of your Council after election was to appoint the various standing committees and leaders in the various branches, to give aid and information to members, and keep records of the season's work. *Fourteen* Council meetings were held during the year at which the routine and executive work of the Club was carried on.

Twenty-nine new members were elected during the past year, whilst a few of our membership have gone, some out of the city to other portions of the country, while others we mourn. Amongst the latter are the following :—

REV. ABBÉ PROVANCHER, of Cap Rouge, Quebec. This zealous and relentless student of Botany and Entomology was elected a *Corresponding member* of our Club in 1886. For many years he edited and wrote extensively for "*Le Naturaliste Canadien*," published in Quebec. The Abbé was the author of several interesting volumes on Natural History in the Province of Quebec.

WILLIAM PITTMAN LETT. For upwards of *nine* years our late lamented City Clerk was an active member of the Club, and occupied the post of Leader in Zoology on several occasions. No one who had the pleasure to listen to Mr. Lett's graphic descriptions of the life and habits of the higher mammalia of Ottawa will ever forget them.

His love for the chivalrous in the glowing scenes of a huntsman's career, together with his narratives of personal encounters with the larger game of the district, are still and will long be fresh in the memories of even the youngest one in our midst. Mr. Lett has contributed several important and reliable papers on his favorite subject, which were published in the "Transactions" of the Club.

W. H. C. SMITH, of the Geological Survey of Canada has also passed away from our sphere of activity. Prematurely, right in harness, engaged at his favourite work and study, Mr. Smith was taken away. He was to have given the Club an evening's entertainment on the "Geology of the Rainy Lake region" in which he had a number of interesting observations to record.

Besides being a Fellow of the Geological Society of America and Secretary of the Logan Club of Ottawa at the time of his death, Mr. Smith was a member of a number of societies and organizations, amongst which he was universally held in high repute.

R. J. TANNER, late Principal of one of our educational institutions, also passed away. His quiet and gentle unobtrusive manner, as well as his courtesy and other personal qualities, had won for him a very large circle of friends.

In his capacity as teacher and student of nature, Mr. Tanner took a deep interest in the welfare of the Club, whilst the city has lost in him a useful and worthy citizen.

The total membership of the Club to-day, amounts to two hundred and seventy-five.

Four general excursions were held during the year and it can safely be said that never heretofore have these been more successful or better patronized.

The opening of the Ottawa and Gatineau Valley Railway has done much to increase the interest and attendance at the excursions held, as the region traversed is beautiful and attractive to students of Botany, Geology, Entomology, &c.

Five Soirées were held during the winter, at which the average attendance was larger than in previous years.

Additions to the Library are coming in steadily from exchanges at home and abroad.

In his report, our energetic Librarian will give you a résumé of the duties devolving upon him and a list of the additions to our Library during the year.

The Treasurer is able to show a balance on hand of \$34.20 which is very creditable as we receive no outside help to enable us to publish the OTTAWA NATURALIST or "Transactions" of the Club. A new departure has been deemed advisable in the publication of the NATURALIST, and Sub-editors were appointed to give notes of observations made in the different branches of the Club's work. This method has met with general approval and satisfaction and added interest to the reading matter in the volume.

The NATURALIST has been published regularly every month, and as near the beginning of the month as possible. It is distributed to the members and exchange list free of charge, whilst a number of copies of the volumes of the Transactions were sold during the year, showing the esteem in which its pages are held by outsiders.

In conclusion, the Council hopes that the new year which will soon begin for the Club will be one marked by increased activity in all branches of the Club's work.

All of which is respectfully submitted,

HENRY M. AMI,

Ottawa, March 21st, 1893.

*Secretary.*

# OTTAWA FIELD-NATURALISTS' CLUB.

## TREASURER'S BALANCE SHEET FOR 1892-'93.

### RECEIPTS.

Balance on hand from last year.....	\$		\$ 28 72
Subscriptions received—			
Arrears of previous years .....		52 00	
Subscriptions of 1892-93 .....		143 40	
Paid in advance for 1893-94 .....		50	
			195 90
“Naturalists” sold by Librarian.....			25 30
Received for “Authors Extras” .....			19 25
“    Advertisements.....			25 50
Net proceeds of Excursions.....			36 24
			<u>\$ 330 91</u>

### EXPENDITURE.

Cost of Printing “Naturalist” Vov. VI.....	\$222 03	
Postage on same.....	27 13	
		249 16
General Postage .....		12 86
“    Printing .....		1 90
Printing “Author’s Extras” .....		17 59
Gratuity to Janitor Normal School .....		5 00
Balance cost of binding periodicals of 1891.....		20
Appropriated for “    ” 1892.....		10 00
Balance on hand.....		34 20
		<u>\$ 330 91</u>

A. G. KINGSTON,  
Treasurer.

OTTAWA, 21st March, 1893.

J. BALLANTYNE, }  
WM. A. D. LEES. } Auditors.

## REPORT OF THE ENTOMOLOGICAL BRANCH.

*To the Council of the Ottawa Field Naturalists' Club :*

The leaders of the Entomological Branch have much pleasure in reporting that satisfactory work was done during the past season. This consisted largely in the exact identification of species in the least worked and more difficult orders. This study has resulted in the addition of many species of beetles to the list of local species published in the Transactions of the Club for 1883-84. The advisability is therefore suggested of publishing at an early date a more complete record of the species found in this district. The occurrence of some of the rarer species has already been recorded in the OTTAWA NATURALIST under the head of Entomology, and it is proposed for the future to continue this method, instead of lengthening the Annual Reports.

A complete list of the Hemiptera was published in our June number, and additions will be recorded from time to time as identified.

In Lepidoptera a considerable amount of work has been done, particularly in the breeding of species. Some rare insects were obtained, of which mention may be made of *Chionobas jutta*, a rare satyrid, concerning the breeding of which at Ottawa some doubt has arisen. This butterfly was taken in the Mer Bleu on the 23rd June. On the same date a specimen of the rare little moth *Exyra Rowlandiana* was found at rest inside one of the cup-like leaves of the pitcher plant, *Saracenia purpurea*. Prof. Riley kindly identified the specimen; he stated that it is an uncommon insect. In the December number of the NATURALIST an account is published of some remarkable feather felting, resulting from the work of the carpet moth caterpillars which infested the contents of a pillow. A specimen of this felting is shown to-night. Some most interesting experiments have been carried out during the past year in transmitting by mail to England pupæ of the Camberwell Beauty butterfly. This journey on two occasions had the effect of producing the remarkable and extremely rare variety known as *Lintnerii*, in varying degrees of definition. One particular specimen had all four wings different. A detailed account of this experiment will be published on a future occasion.

In the order Hymenoptera numerous additions have been made to collections, including some of great interest. A feature of the year has been the abundance of parasitic species. Mention may be made of two which did good service in destroying the eggs of two very injurious pests of the garden, viz., the imported current sawfly (*Nematus ribesii*) and the zebra caterpillar of the cabbage and other plants (*Mamestra picta*). An extended notice of these will be found in the forthcoming report of the Experimental Farms. A list of our Phytophagus Hymenoptera is now ready for publication when space permits in the NATURALIST.

Several collecting expeditions were made during the summer, the most interesting of which was a visit of two of the leaders to Sudbury, where in company with Mr. J. D. Evans, a member of the club and an energetic entomologist, they spent three days collecting. Although the weather for a portion of the time was not propitious, a large number of rare and interesting forms were secured.

(Signed),	W. H. HARRINGTON,	} <i>Leaders.</i>
	J. FLETCHER,	
	T. J. MACLAUGHLIN,	

Jan. 19th, 1893.

### BOOK NOTICE.

Report of Observations of Injurious Insects and Common Farm Pests, during the year 1892, with Methods of Prevention and Remedy.

The Sixteenth Annual Report, on the pests injurious to the British farmer and gardener, by Miss Eleanor A. Ormerod (a corresponding member of our Club), indicates that this talented lady is still indefatigably prosecuting the useful investigations which have made her famous in the field of economic entomology. The present report attains a length of 163 pages, and treats of a score or so of interesting subjects, of which a few only can be here indicated. The Sawfly, whose injuries to the apple were noted in the previous report, has been bred through its several stages and has proved to be *Hoplocampa* (*Teuthredo*) *testudinea*, Klug. This Sawfly inserts its egg in the embryo apple, when the fruit is setting, and the larva, when hatched, feeds in the interior of the fruit and destroys it. Several European sawflies have already reached Canada, and inflicted a great deal of injury, and it is

sincerely to be hoped that the above pest may not also be introduced. Some insects well known to American agriculturalists are treated of in relation to various plants. Among these are the Asparagus Beetle, which has been to some extent injurious in the Atlantic States, but which has not yet reached Canada. We have, however, the Cabbage Aphis, Corn Aphis, Hessian Fly, Mangold Leaf-blisters Maggot, Onion Fly and Diamond-back Moth of the Turnip. Pea-weevils are mentioned, but these are not the *Bruchus pisi* which occurs here, but beetles which belong to the genus *Sitona* (true Curculionids,) and which attack the foliage. Several pages of the report are devoted to the serious attacks upon tomato of the *Heterodera radicola*, a small nematode worm (such are popularly known as eel-worms,) which causes the growth of knots, or galls, on the roots of this plant, and on others, such as the cucumber, potato, parsnip, etc. This pest appears to be especially injurious to the crops grown under glass, and has caused great loss to some of the extensive growers. Several insect enemies of the turnip and cabbage are noticed, and considerable space is given to a discussion of the disease known as Finger-and-toe, the cause of which is the Slime Fungus, *Plasmidiophora brassicae*. This fungus is also injurious here, and has been treated by Mr. Fletcher in his reports, as the Club-root of the Cabbage. Miss Ormerod's report is conveniently arranged under appropriate headings, and in connection with each infestation the most suitable remedies are carefully considered. The mechanical part of the work is well in keeping with the contents, and, besides numerous wood-cuts of the various pests, there are four excellent photo-gravure plates, illustrating the root diseases to which reference has been made.

W. H. H.

First Excursion, Saturday, May 27th.

May, 1893.

THE  
OTTAWA NATURALIST.  
VOLUME VII. No. 2.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:  
PAYNTER & CO., PRINTERS, 48 RIDEAU STREET.

Issued April 29th, 1893.

Published Monthly at \$1.00 per annum.

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EXTRAS—BILLINGS, W. R. Palæontology. An elementary lecture,  
pp. 11, 5c.

ELLs, R. W. Asbestos ; its history, mode of occurrence and  
uses. pp. 24, 10c.

## NOTES ON CANADIAN BRYOLOGY.

By DR. N. C. KINDBERG, Linköping, Sweden.

(Communicated by John Macoun. M.A., F.L.S., F.R.S.C.)

*ANDRÆA SPARSIFOLIA*, Zett. *Var. SUBLÆVIS*, Kindb. (N. var.)

Leaves generally smooth, rarely faintly papillose; the perichetial ones subobtus.

Near Cape Beale, Vancouver Island, May 9th, 1892. (J. M. Macoun.)

*DICRANOWEISIA OBLIQUA*, Kindb. (N. sp.)

Differs from *D. crispula*, principally in the capsule being asymmetric, curved, substrumose in a dry state; the perichetial leaves being acuminate, and the costa excurrent in all leaves.

On stones along Asulcan Creek, near the Glacier Hotel, Selkirk Mountains, B.C. August 8th, 1890. (Macoun.)

*DICRANELLA POLARIS*, Kindb. (N. sp.)

Tufts dusky green, not shining, fuscous below. Stems 1-3 mm. high, erect and simple, leaves rigid, patent-erect, nearly straight, from the ovate-oblong base narrowed to the subulate, indistinctly two or three toothed, acuminate; cells not papillose, the lower marginal narrow, the upper sub-oblong; costa broad, often two-thirds of the lower part below, faintly marked, filling the whole acuminate; perichetial leaves larger, entire, broader at the base, with more numerous marginal cells. Capsule asymmetric suboval, finally subclavate, curved, smooth, short-necked, orange; lid with a long, oblique beak; peristome of 16 teeth, nearly entire, slightly cleft above, orange with paler tips; annulus not distinct; pedicel yellow, erect, 10-12 mm. long. Spores small, about 0.015 mm. Calyptra short, dimidiate.

Differs from *Dicranella cerviculata* in the structure of the peristome, the broader leaf costa, and the larger perichetial leaves; also from *D. heteromalla* in the smaller size, the rigid leaves, the broader costa and the not striate capsule.

St. Lawrence Island, Behring Sea, Aug. 15th, 1891. (J. M. Macoun.)

*DICRANELLA CERVICULATULA*, Kindb. (N. sp.)

Agrees with *D. cerviculata* in its dioecious inflorescence, the strumose capsule and the yellow pedicel; differs in the leaves being gradually acuminate, the cells short quadrate, only the inner at the base rectangular, the costa narrow, well-defined, and not filling the acumen, only in the perichetial leaves distinctly excurrent. The tufts are very dense and compact, dark green, the leaves not spreading, the pedicel is short about 7-8 mm., the stem 5 mm.

On Digge's Island, Hudson Strait, August, 1884. (R. Bell.)

*LEPTOTRICHUM* (*Ditrichum*) *TOMENTOSUM*, Kindb. (N. sp.)

Tufts very compact and tomentose, 2-3 cm. high, the tips yellowish green, faintly glossy. Leaves small, entire, from the ovate-oblong base attenuate to the involute or canaliculate, scarcely longer or often shorter acumen, appressed in a dry state; costa occupying the half of the leaf-base, and the whole acumen; alar cells not distinct, the lower ones subrectangular, the upper shorter, suboval. Barren.

Probably allied to *Leptotrichum homomallum* or *Lepto. zonatum* Lev. The leaves are broader than in *L. homomallum*, and not so long-acuminate. It has also the habit of *Campylopus*, and some forms of *Dicranella heteromalla*.

St. Paul's Island, Behring Sea, July 3rd, 1892. (J. M. Macoun.)

*RACOMITRIUM FASCICULARE*, Biid. Var. *HAPLOCLADON*, Kindb. (N. var.)

Branches attenuate, acute, simple, or nearly without branchlets.

St. Paul's Island, Behring Sea, July 6th. 1892. (J. M. Macoun.)

*MNIUM GLABRESCENS*, Kindb. (N. sp.)

Differs from *M. punctatum* in the stems being nearly glabrous, the leaves green, not nigrescent, faintly reflexed at the borders in a dry state, the upper leaves narrower, oblong or oblong-lanceolate, the cells smaller, more rotundate, the costa red only in the middle, (as in *M. stellare*) pale at the borders, the inner perichetial leaves ovate-oblong subobtuse, the pedicel sometimes 5-6 cm. long.

Sitka, and Port Etches, Alaska, 1891-92. (J. M. Macoun.)

Swamps, Queen Charlotte Islands, and Comox, Vancouver Island, 1878, 1885. (Dawson.) Near Victoria, and at Comox, Vancouver Island, 1875, 1887. (Macoun.)

*LESKEA MOSERI*, Kindb. (N. sp.)

Stems creeping, irregularly branching or pinnate. Leaves small, green, not glossy, from a short ovate, at the borders recurved, base, narrowed to a longer and filiform acumen, entire, indistinctly papillose; cells rotundate or quadrate; costa percurrent or excurrent. Perichetial leaves narrowly ovate-oblong, obtusate, short-acuminate, serrate above, at least to the middle. Capsule erect, cylindric-lanceolate, with a small mouth; peristome pale; endostome as long as the teeth; cilia none; lid conic, short-apiculate; pedicel about 2 cm. long. Male flowers not found. Differs from *Leskea nervosa*, principally in the leaves being longer-acuminate, and the perichetial ones subobtusate; it differs also in the peristome.

Tay Forks, York Co., N.B., 1890. (J. Moser.)

*ANOMODON PLATYPHYLLUS*, Kindb. (N. sp.)

*A. obtusifolius*, Can. Musc., No. 256; Macoun Cat., Pt. VI, 171.

Stem irregularly divided or irregularly pinnate; branches thick; leaves large, pteris-like and crisped when dry, (as in the *Anomodon apiculatus* and *A. viticulosus*), undulate and entire at the borders, very broad, nearly ovate-oblong or from a little broader, cordate and strongly papillose, base slightly narrowed to the lingulate at apex rounded acumen; inner basal cells subhyaline, not well-defined. Perichetial leaves strongly papillose and subdentate at the base, and contracted to a narrow, lingulate acumen. Capsule much smaller than in *A. apiculatus*, oval-oblong; endostome rudimentary; lid short-conic, not rostellate; pedicel yellow, less than 1 cm. long. Dioecious.

Differs from all our other species in the broader leaves, from the nearly allied in the small capsule.

Apparently all my specimens of *A. obtusifolius* are of this species. (Macoun.)

PSEUDOLESKEA ATRICHA, Kindb. (N. sp.)

*P. atrovirens* Var. *atricha*, Kindb., Macoun, Cat., Pt. VII, 180.

Tufts brownish or olivaceous, with green tips, loosely cohering, without rhizoids. Leaves distinctly papillose, ovate-oblong, short-acuminate, serrulate at the acumen; cells elongate, conflated, irregularly sinuous. Capsules not found.

On rocks along the Eagle River, just below the little bridge at Griffin Lake, B.C., August 11th, 1889. (Macoun.)

THUIDIUM (Elodium) PSEUDO-ABIETINUM, Kindb. (N. sp.)

Stems imbricate, densely tufted, creeping, densely brown-tomentose, simply pinnate; branches distant, short. Stem-leaves faintly papillose, broad-ovate, short-acuminate; cells generally elongate, the middle ones oval-oblong; branch-leaves ovate-oval subobtuse, distinctly denticulate and papillose on both sides, opaque. Capsule curved, lid not found. Monoecious. Habit of *Thuidium* (Elodium) *paludosum*.

In a swamp a little west of Britannia Station; and south of the Canadian Pacific Railway, six miles west of Ottawa, September 11th, 1890. (Macoun.)

THUIDIUM ABIETINUM, \*PACHYCLADON, Kindb. (N. subsp.)

Differs in the branches being crowded, the stem leaves gradually long acuminate, ovate-lanceolate, the apical cells narrow, the basal orange. Capsules not found. Resembling in habit *Thuidium Blanfordii*.

On rocks, summit of Tunnel Mountain, at Banff, Rocky Mountains, Alt. 5,500 feet, June 29th, 1891. (Macoun.)

ISOTHECIUM MYOSUROIDES, \*BREVINERVE, Kind.

*I. acuticuspis*, Mitt.

Differs in the stem leaves being nearly entire, long acuminate, with a short and sometimes forked or indistinct costa. Capsules not found. Dioecious.

New Harbor and Speedwell Bay, Newfoundland, Dec. 11th, 1890. (Rev. A. C. Waghorne.)

ISOTHECIUM MYOSUROIDES, \*HYLOCOMIOIDES, Kindb. (N. subsp.)

Branches subjulaceous, sometimes bipinnate. Leaves larger than in the type, short-acuminate, those of the branchlets subobtusate; costa stout.

On old logs at Comox, Vancouver Island, April 30th, 1887. (Macoun.)

*EURHYNCHIUM SUBSCABRIDUM*, Kindb. (N. sp.)

*E. Sullivantii*, Macoun Cat., Pt. VI, 206.

Tufts pale green above, dirty yellow below. Stem creeping, pinnate; branches subjulaceous, nearly crowded, long and attenuate, Leaves long-decurrent, not striate, very papillose on both sides, serrulate nearly all around; borders reflexed below; cells sublinear or lanceolate, those in the angles short and numerous; costa vanishing near the acumen. Stem-leaves ovate with a subfiliform point; branch-leaves ovate-oblong, generally long-acuminate. Perichetial leaves nearly entire, filiform pointed. Capsules not found. Dioecious or pseudomonocious.

Allied to *E. Sullivantii*, Canadian Musci., No. 296. This species was examined by James and Austin, and pronounced *E. Sullivantii*, but Lindberg, in 1871, named it differently. The specimens from Royston Park that were distributed as No. 296. See Macoun Cat. VI, page 206, for distribution. (Macoun.)

*EURHYNCHIUM SUBINTEGRIFOLIUM*, Kindb. (N. sp.)

Tufts green, not glossy, sparingly radiculose. Stem irregularly branching or subpinnate; branches complanate. Leaves somewhat large, long-decurrent, faintly striate, distant and subdistichous, ovate-oblong, short apiculate, nearly entire, minutely denticulate near the apex, chlorophyllose; cells sublinear, the alar short and somewhat numerous, not large; costa thin, generally reaching to the acumen. Capsule arcuate or subobovate; lid not found; pedicel long and smooth. Probably dioecious.

Habit of *Eurhynchium* (*Rhynchostegium*) *serrulatum*; allied to the European *Eurhynchium* (*Rhynchostegium*) *megapolitanum*.

On old logs in woods along the Columbia River, about one mile above Revelstoke, B.C., May 5th, 1890. (Macoun.)

*EURHYNCHIUM REVELSTOKENSE*, Kindb. (N. sp.)

Tufts pale green. Stem pinnate, creeping; branches complanate. Leaves distichous, plicate, pellucid, ovate-lanceolate, long-subulate, minutely denticulate, sometimes short-decurrent; cells lanceolate, those in the angles short and large; costa thick, reaching to above the middle. Capsule arcuate; pedicel short and smooth. Lid and male flowers not found.

On old water-soaked logs in woods west side of the Columbia River, at Revelstoke, B.C., May 6th, 1890. (Macoun.) This species and the preceding were included in the references under *B. serrulatum* in Part VI.

*EURHYNCHIUM SERRULATUM*, \**ERICENSE*, Kindb. (N. subsp.)

Differs in the leaves being shorter, subovate, less distant, nearly crowded, also in the smaller, and short-pedicellate capsule.

On earth in woods a little west of Leamington, Essex Co., Ont., Sept. 21st, 1890. (Macoun.)

*EURHYNCHIUM SERRULATUM*, \**HISPIDIFOLIUM*, Kindb. (N. subsp.)

Differs in the branches being longer, the leaves very long, ovate-lanceolate, long-acuminate and sharply dentate. Capsules and flowers not found.

On old logs, Hastings, Burrard Inlet, B.C., April 8th, 1889. (Macoun.)

*EURHYNCHIUM PSEUDO-SERRULATUM*, Kindb. (N. sp.)

*Rhynchostegium serrulatum* Canadian Musci. No. 456.

Tufts dark green, faintly glossy, radiculose at the base. Stem irregularly branching or subpinnate; branches complanate. Leaves distichous, striate, often larger than in *E. serrulatum*, chlorophyllose, ovate or ovate-oblong, minutely denticulate, not or indistinctly decurrent; cells lanceolate, the lower shorter and more dilated, principally the alar ones; costa thin, reaching above the middle. Stem

leaves filiform-pointed or short-acuminate ; branch-leaves with a short, subulate, sometimes twisted acumen. Capsule arcuate ; lid short-fos-tellate ; pedicel rough. Monœcious.

Differs from *E. serrulatum*, principally in the striate, minutely denticulate leaves, the capsule not rostrate, and the rough pedicel.

On earth in woods at Beechwood, Ottawa ; (Macoun.) At Tay Forks, York Co., N.B. ; (J. Moser.) Western Cove, Harbor Deep, and Seal Cove, Newfoundland, 1891 ; (Rev. A. C. Waghorne.)

RAPHIDOSTEGIUM PSEUDO-RECURVANS, Kindb. (N. sp.)

Tufts olivaceous, not or faintly glossy. Leaves patent and in-curved-falcate when dry, ovate-lanceolate, long-acuminate, gradually narrowed to the filiform point, minutely denticulate nearly all around ; cells linear, the alar not large. Perichetial leaves long-subulate, denti-culate only at the long, linear point. Capsule obovate ; lid not found ; pedicel short. Probably dioecious.

On the bases of trees west of Columbia river, and south of the Railway Bridge at Revelstoke, B.C., May 5th, 1890. (Macoun.)

HYPNUM (Drepanium) ALASKÆ, Kindb. (N. sp.)

Stem regularly pinnate, creeping. Stem-leaves small, entire, not reflexed at the borders, ovate-lanceolate, equally attenuate to a subuli-form or finally hair-like acumen, shorter than the base ; alar cells in-flated, very distinct, sometimes yellow, the other cells hyaline. Dioecious.

Differs from *H. callichroum* in the creeping stem, etc., from *H. curvifolium* also in the smaller leaves. It has the habit of *H. hamu-losum*.



## THE AIR OF OUR HOUSES.

BY FRANK T. SHUTT, M.A., F.I.S., F.C.S., 1ST VICE-PRESIDENT.

Delivered December 15th, 1892.

I have selected this subject, chiefly, for two reasons. First: although it is one of great importance, and has a vital interest for every one of us, widespread ignorance prevails regarding the grave danger to health from continuously breathing impure and vitiated air. Secondly: because it will form a fitting sequel to the lectures on Water and Food which I delivered on former occasions before this Club.

In pursuance of the course I adopted in those addresses, I propose to discuss the subject from the hygienic, as well as from the chemical, standpoint. My endeavour will be to point out the composition of pure, normal air; the nature, sources, and amounts of impurities in vitiated air; and the effects of these impurities upon the system.

### THE ATMOSPHERE.

The atmosphere that surrounds our earth is composed, chiefly, of two elements—Oxygen and Nitrogen. These gases exist in the air, not as a chemical compound of the two, but in the free and uncombined condition. This can be easily and abundantly proved. I shall content myself, however, with telling you of a few of the reasons why air must be considered as a mechanical mixture of its constituents, and not a compound. The ratio, or proportion of the oxygen to the nitrogen in the air does not correspond to the ratio existing between these elements in any of the oxides of nitrogen, which are true chemical compounds. Neither the relative nor absolute amounts of the oxygen and nitrogen remain always the same and constant; and it is a *sine qua non* that the ratio between the constituents of a chemical compound should be invariable. Again, water dissolves from air both oxygen and nitrogen, but owing to the greater solubility of the former and the laws of gas absorption, the proportion between them in the dissolved air is not that existing between them in the atmosphere. For instance:

	Air dissolved in Water.	Atmospheric Air.
Oxygen .....	34.92 .....	20.96
Nitrogen .....	65.08 .....	79.04
	<hr/>	<hr/>
	100.00	100.00

Such would not take place if the oxygen and nitrogen were chemically united.

Let me briefly remind you of some of the salient properties of these elements, and the functions they perform in the atmosphere.

#### OXYGEN.

Oxygen is known as the "supporter of combustion," since it is essential for combustion, whether such be accompanied by flame or not. It is the active element. It is the life-giving or, rather, life-supporting element. Without it animal life could not exist. In one of our former lectures we saw the vigour with which it united with many of the elements, giving out both light and heat, and learnt how, that of the compounds similarly formed, the rocks and the soil were very largely composed. Hence, oxygen may be termed the world-building element.

#### NITROGEN.

Nitrogen is an inert, inactive gas, incapable of supporting life or combustion. Its function in the atmosphere, as far as respiration is concerned, appears simply to be for the purpose of diluting the oxygen. For though oxygen is so necessary and essential for vitality, yet we could not live long in atmosphere of *pure* element. Such would shorten our lives to a very brief period, and we should hourly stand in jeopardy of an almost universal conflagration.

Roughly speaking, the air consists of one-fifth of oxygen, and four-fifths of nitrogen, by volume; but since it has been shown to be a mixture, and not a compound, we should expect to find the relative amounts of these gases variable. And this is the case, within small limits. From many hundred analyses of air made in different parts of the world, the percentage of oxygen in pure, wholesome air varies from 20.989 to 20.949 by volume. The extreme difference, then, amounts

to .04 per cent. The maximum amount of oxygen is to be found in the air on the sea shore and mountain sides.

#### OTHER CONSTITUENTS OF AIR.

We have said that air consists chiefly of oxygen and nitrogen, but *normal* air always contains small and variable quantities of vapor of water, carbonic acid, organic matter, and ammonia and ozone. Air vitiated by breathing, as we shall see, contains some of these constituents in excess, while others of its constituents are diminished. In addition to the above it should be mentioned that in the vicinity of large smelting and chemical works, certain gases, e.g. Sulphuretted hydrogen, Hydrochloric acid, etc., may be present, and pollute and poison the air. Owing to the law of the diffusion of gases, and the prevalence of air currents, there is always present the *tendency* to preserve a constant composition of the atmosphere, and thus it is that noxious gases cannot accumulate to a dangerous degree, save under extremely artificial circumstances.

#### THE MOISTURE OF THE AIR.

Moisture or vapor of water, always present in the atmosphere, is the result of the evaporation of water from the ocean, lakes and rivers, as well as from the soil and vegetation. Its amount is directly dependant on the temperature. Hot air can hold or absorb more moisture than cold air. When saturated air is cooled, moisture is deposited, of which the well known condensation on the outside of a glass of cold water in summer, is an illustration. Our breath is loaded with moisture, and hence the determination of the amount of moisture in the air of a room may sometimes serve as a guide to a correct diagnosis of its condition. Over the hygrometric state of the atmosphere, of course, we have no control, though to a certain extent, and especially in winter, we can regulate the amount of moisture in the air of our houses.

#### EFFECT OF EXCESS OR DEFICIENCY OF MOISTURE.

It might be well here to note that an excess or deficiency (above or below the normal amount) exerts a decided action upon the health. An excess of moisture is more prejudicial than a deficiency, since, in the first place, it tends to preserve the organic matter, which is one of the

chief impurities in vitiated air. It also seriously interrupts or interferes with the exhalation from the skin and lungs. When excessive moisture is associated with high temperature, we are cognizant of an oppressive and sultry feeling, and an enervation of mental and bodily vigour; with low temperature it is conducive to a damp, penetrating chilliness, which seems to search us through and through. Coughs, colds and rheumatic troubles are common when this state of atmosphere prevails. When the air is too dry, the mucous membrane of the mouth, pharynx and nostrils become parched, and the use of the voice impaired or impossible. A general irritability of the system is a common result of too dry an atmosphere.

#### CARBONIC ACID.

Carbonic acid gas, until quite lately, has been regarded not only as the chief impurity, but as the only impurity of vitiated air, and the one constituent that it is necessary to determine when examining an air for hygienic purposes. Important as it is that carbonic acid should not be allowed to exceed a certain amount in an air we breathe, we now know also how detrimental organic matter is, and that we must look upon it as probably the much more dangerous to health of the two. Carbonic acid is always present in the atmosphere. Over the sea, on mountains and moors, and in localities far from contaminating sources, it varies from .03 to .04 per cent. by volume. It is the result of the union of carbon (or charcoal) with oxygen. It is formed in the process of combustion, in the respiration of animals, and by decay or putrefaction of organic matter in the air. The chemistry, as far as the result is concerned, is precisely the same in all of these. The burning of wood, coal or other material rich in carbon and hydrogen, is accompanied by the development of heat and light. This is what is commonly understood as combustion. The products are carbonic acid gas, and water. By estimating their amounts, the chemist can tell how much carbon and hydrogen the burnt material contained. And again, knowing the weights of carbon and hydrogen in a substance, the heat that will be generated by their combustion can be calculated with accuracy, since in their union with oxygen they always produce for a known weight a certain amount of heat.

## RESPIRATION.

The process of respiration is really one of combustion, though unaccompanied by flame. Our food is rich in carbon and hydrogen. Starch and sugar, fats and albuminoids, of which our food consists, all contain large amounts of these elements. The blood which receives the digested food from the alimentary track is pumped from the right side of the heart into the lungs, where it is passed through countless small capillary tubes, with extremely thin membranous walls. It is here that it comes into close contact with the inspired air, the oxygen of which it absorbs in large quantities. From the lungs it is then passed through the left side of the heart, and forced into the general circulation of the body. During its circulation, the absorbed or dissolved oxygen burns up the food material in the blood, forming carbonic acid and water, which are discharged chiefly on the reflow of the blood to the lungs though small quantities escape by way of the skin. The heat generated in the combustion of this food in the body to carbonic acid and aqueous vapor, is precisely equal to the amount that would have been produced if the food material had been burnt in the air; and it is the heat so generated that maintains our body temperature.

## DECAY AND PUTREFACTION.

Decay and putrefaction have been mentioned as the third source of carbonic acid gas in the atmosphere. These processes of the disintegration and dissipation of organic matter, are really of the nature of slow combustion, usually brought about by the agency of microscopic plants, known as bacteria. Their products are much the same as those resulting from the combustion of fuel and of food.

## ORGANIC MATTER.

Having now discussed the sources of the carbonic acid in the air, we must now speak of the organic matter, which is more especially present as the result of deficient ventilation.

It has already been mentioned that the deleterious character of badly ventilated rooms is due rather to the organic matter than to the carbonic acid. It is therefore of great importance that we should learn somewhat of its origin and effects upon health. Organic matter, and

ammonia in small quantities, are from much the same source as the carbonic acid. Our breath contains comparatively large quantities. Air fouled by the gases produced by decay, by sewage emanations, by contact with fifth of all kinds, is loaded with organic matter, largely in the form of noxious gases, which may contain disease germs, but which, at all events, is extremely detrimental to health.

The unpleasant odour, and sometimes even taste, experienced on entering crowded and heated rooms, is due to organic matter in the atmosphere. The pleasurable sense of relief on going out into the fresh air from a room, is a sure indication that its air is seriously contaminated with organic matter. We should take care that we do not habituate ourselves to unpleasant odours of this kind. The constant smell of food in the house should be avoided, or rather prevented. Dust should not be allowed to accumulate in carpets; worn clothing should be thoroughly aired before putting away, and above all, defective drainage should at once be made perfect.

#### AIR VITIATED BY RESPIRATION.

Let us now briefly recapitulate those points, in which expired air differs from that of the atmosphere.

1. Its oxygen is largely reduced. By respiration between 4.5% and 5.0% of oxygen is removed for the combustion of the food material in the blood.
2. It contains a considerable amount of organic matter of a particularly deleterious character. From the lungs alone about 3 grains are thrown off daily, and to this must be added the variable amount from the exhalations of the skin.
3. The carbonic acid is largely increased. While fresh air contains about 4 volumes of carbonic acid per 10,000, expired air contains between 400 and 450 volumes in the same quantity. This tremendous increase is easily understood when we remember that the individual breathes about 18 times per minute, and at each respiration produces nearly  $1\frac{1}{3}$  cubic inches of carbonic acid. This amounts to  $\frac{2}{3}$  cubic feet per hour, or at least 16 cubic feet in the 24 hours—a quantity equal to that produced by the burning of  $7\frac{1}{2}$  oz. to 8 oz. of carbon.
4. The amount of aqueous vapor is augmented, for, as we have

already seen, expired air is saturated, or nearly so, with moisture. The quantity thrown off from the lungs daily is subject to variation, but is usually between 9 and 10 ounces.

#### EFFECTS OF VITIATED AIR ON HEALTH.

I have already pointed out that vitiated air, and more particularly air that has received largely the products of respiration, is extremely deleterious to health. But I would now emphasize the insidious character of these impurities, how they gradually undermine the health and how easy it is for us to habituate ourselves to a morbid condition of the air we breathe. Fainting fits, giddiness, nausea, and headache are recognized as the immediate results of breathing the air of badly ventilated halls and rooms, but it is not so widely known that indigestion, diarrhoea, and impaired and feeble condition of the system—a general lowering of the bodily and mental vigour are often caused by the continuous breathing of vitiated air. Those who through carelessness, or apparent necessity of circumstances, live and work in a confined atmosphere, run a great risk, for apart from immediate evil results, they are not in a condition to resist attacks of zymotic diseases. Further, statistics clearly prove that the death rate of those living and working in an impure atmosphere (e.g. certain factories, mines, crowded tenement houses, etc.), is much higher than amongst those whose more fortunate lot allows them to live and work in a purer air.

#### VENTILATION.

For private dwellings no cheap and efficient system of artificial ventilation has as yet been invented. For public halls, schools, hospitals, and the like, however, there are now systems by which the air may be kept perfectly wholesome without creating a draft, either in summer or winter, and at the proper degree of temperature and moisture. What we might call public ventilation should now become a matter for legislation. Our public schools, halls of assembly, and all confined spaces, where large numbers of people congregate, should all be provided with the requisite means for constantly renewing the air. As private individuals, we have to be thankful that the materials of which our houses are constructed—and more especially brick and plaster—are porous, allowing a constant interchange of the air within with that outside. We should take care to increase this

interchange as much as possible by such means as are available. Draughts from open doors and windows are certainly to be avoided, but they may be overcome by judiciously placed screens and numerous other devices for distributing the current of fresh air. One such that answers admirably for the bedroom in winter is to raise the lower sash of the window, allowing it to rest on a piece of board some three inches high, and which fits snugly into the window frame. The air will now enter in a broad stream between the upper and lower sashes, and the sliding pane of the storm sash can be left open, as a rule, without fear of a draft. I might add here, that it is extremely important for the air of a bedroom to be pure and fresh, and the temperature of a room should be such as to allow the above, or some similar, method of ventilation to be practised throughout the winter. A grate fire is perhaps the very best means of assisting ventilation for private houses. If its function were only that of keeping the air of the room pure it could not be too strongly recommended, for it compels fresh air to enter by doors and windows, and by its strong draught continuously renovates the atmosphere. Looked at as a source of heat, it may be considered extravagant, but is certainly the most healthful, as well as the most pleasant and attractive of all our modes of heating. The windows should be opened for ten minutes first thing in the morning, and the whole air of the house renewed. Even on the coldest day, this will be found economical as regards fuel, as well as invigorating.

#### TEMPERATURE OF THE HOUSE.

One word may be said here regarding the temperature of our houses in winter, since it is a matter closely related to ventilation. It is more healthy to have the air of our bedrooms too cold than too hot, and the same remark refers, though not with equal force, to the rest of the house. I feel sure that many diseases of the lungs and throat are the result of going out of our over heated houses into the severe cold. The difference in temperature is enormous, and the system is in the worst possible condition to withstand the shock.

And now that I am about to conclude my lecture and these suggestions, which if put into practice may mean better health for many of us, let me urge upon every householder the necessity of knowing that

the drains are properly trapped, and in good working order. No expense should be spared, if health is a matter of importance, in preventing the possibility of sewer gas entering the house. Then again, cellars should be drained, dry and well ventilated. Refuse and garbage should not be allowed to accumulate in or about the house. Perhaps the best means of disposing, in the city house, of vegetable refuse and general kitchen scraps is the cooking stove. From a sanitary standpoint it has not its equal.

In the matter of ventilation, as in everything else, we should use our common sense. We all have some powers of observation, we can all study cause and effect, even if we do not understand fully the chemistry that underlies it all. Let us see to it as a people—both in town and country—that in this matter of fresh air we do not err in the future as we have done in the past. We have learnt the origin and detrimental effects of foul and vitiated air; let us not from carelessness or wilful neglect refuse to take necessary means to provide our houses with fresh pure air.

—————:O:—————

### EXCURSION No. I. To LA PÊCHE.

The Excursion Committee has made the necessary arrangements for the first excursion of the season. The date selected is Saturday, May 27th, and the locality to be visited is that known as La Pêche, or Wakefield, a most picturesque and attractive resort. The party will leave the C. P. R. Union Station at 9.45 a.m. by the Gatineau Valley Railway.—Before returning the Leaders in the several sections of the Club's work will make the usual brief addresses on the results of the Outing. Bring your friends and any persons whom you know to be interested in Natural History.

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June, 1893.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 3.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued May 31st, 1893.

Published Monthly at \$1.00 per annum.

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## MY AQUARIUM.

BY H. B. SMALL.

(Read March 2nd, 1893.)

In a work that I published on "The Fresh Water Fish of Canada," I quoted on the title page, the following passage from W. Scrope, a writer in the early part of the century, where he says:—"I like the society of fish, and as they cannot with any convenience to themselves visit me on dry land, it becomes me in a point of courtesy to pay my respects to them in their native element." Quaintly as he expressed it, it forshadowed the study of their habits. Now Nature opposes certain obvious obstacles to the pursuit of knowledge in the water, which renders it difficult for the ardent naturalist, however much he may be so disposed, to carry on his observations with the same facility as in the case of birds and mammals. Still, by observation here and experiment there, watching through a sheet of plate glass, naturalists manage to piece together a considerable mass of curious and interesting information of an out of the way sort, about the domestic habits and manners of sundry members of the finny tribe. To the eye of the mere casual observer, every fish would seem at first sight to be a mere fish, and to differ but little from all the rest of his kind. But when one comes to look closer into their ways, one finds fish are in reality as various and as variable in their modes of life, as any other great group in the animal kingdom. Concealed under stones in babbling brooks, hiding in the grassy margin of purling streams, buried in the depths of silent ponds, roaming in the submerged forests of aquatic vegetation, is a multiplicity of animal life that may profitably be made a study, and to thoroughly explain which would require a lifetime.

In 1850, Mr. Robert Warrington addressed to the Chemical Society of London, a series of observations on the fact announced by Ingraham in 1778, that plants immersed in water when exposed to the action of light, emit oxygen, and the consequent necessity of their presence for the preservation of animal life. He reported placing two small gold-fish in a glass, having first planted in sand and earth at the bottom, a small plant of valisneria. The latter, as the leaves decayed,

fouled the water, and to remedy this he tried the introduction of a few snails, which, feeding on decaying matter, quickly restored purity and clearness to the water. In 1852, he experimented with sea-water and its occupants, with equal success. To Mr. Grosse, however, the well-known naturalist, may be attributed the popularity of the Aquarium which is certainly the purest of all household recreations. His first work on the subject, somewhere about the year 1855, was read with avidity, and although the London "Punch," levelled its keenest wit and satire against the new mania, and pointed to all the mishaps which might befall housekeepers by the breaking of the Aquarium and the consequent deluging of carpets, the passion for aquaria grew, and in 1857 they may be said to have been formally established in England. In that year, one of the quarterly Reviews remarked that the making and stocking of these had created a new and important branch in commercial industry. In 1856, Barnum introduced into New York the first of what he styled—"Ocean and River Gardens," and a few months afterwards they were for sale of all sorts and sizes, for private use. Before that, the glass globe for gold-fish was the only representative of the new apparatus. In keeping an Aquarium, very little is wanted besides the tank itself. It is well to have an india-rubber tube or a syphon for drawing off the water when necessary; a wooden forceps for removing any object, and a sponge stick for cleaning the glass, together with a small fine-meshed hand net for handling any of the inmates if need be.

Some years ago, when residing in New York State, I was attached to one of the Military Colleges affiliated with West Point; and one of the first things that I did to engage the interests of the Cadets under my charge, was to turn their minds, during leisure hours, to the study of Natural History.

As I was at that time making collections of all kinds, I enlisted them in the work of procuring specimens, and I organized, on our Saturday holiday, field parties among the woods and mountains in the vicinity of the College, along the Hudson River. This was just at the time when Aquaria were in vogue, and I took advantage of the first visit that I paid to New York, to purchase an Aquarium for my own private use, which I kept in my quarters, open to the inspection of all

who wished to see it. This was over thirty years ago, and that I still have the Aquarium in almost as good condition as when I purchased it, is, I think, sufficient evidence that it was well adapted for its purpose. It is a comparatively small one, being only fifteen by nine inches. I think I may say it has done its full share in the way of attracting attention to "Life below the water." The first great difficulty I had to contend with was the multiplicity of objects that were brought to me for it by my cadets.

You would be astonished if I were to give you all the varied suggestions that were made respecting what should constitute the floor of the tank, some recommending small pebbles, others, gravel or sand, till finally a compromise was effected to the satisfaction of all, by giving each of the proposed materials its own place. Experience afterwards showed that a little clean river sand is the safest ground work for all purposes. Then there was the natural inquisitiveness of boyhood to combat. Whilst the novelty was at its height, the inmates were subjected to all sorts of ordeals, such as poking up with a stick, to see if they were lively; and a continual desire was evinced to handle them. Over-feeding was one of the most trying evils to contend against, for the superfluity of bread and meat supplied, in all good intent, for the use of the inmates, had a tendency to sour and discolor the water, and to create when overdoses were administered, a fermentation by no means conducive to vitality. However, for the sake of encouraging research and creating amongst the cadets an interest in my Aquarium, I would naturally put up with all these little inconveniences, removing as soon as possible when left to myself, all extraneous matters from the water, and by frequent use of the siphon withdrawing the disturbed contents to be replaced with fresh, healthy, spring water. In a very little time the Aquarium ceased to be a wonder and became an object of interest, and so my point was gained.

I well remember its first inmate, which was the larva of a Dragon-fly, the various stages of whose subaqueous life were of continual interest, and great was the astonishment one day, when only an empty case was found attached to the stalk of the water weeds, its inmate having taken to itself wings and disappeared. The locality afforded a splendid field for collecting, as the Croton River emptied into the Hudson within a

mile or two of the College. Rockland Lake and Haverstraw Bay were on the opposite shore, whilst in the hills back of us were numerous ponds and streams abounding with life. Near the mouth of the Croton River lay the old Van Cortland Manor House, on the lawn of which was a fish-pond, constructed by some of the early Dutch occupants and well stocked with gold-fish. During a heavy freshet one spring, some years previous to the time I am talking of, the banks of this pond gave way, discharging its waters and its contents into the Croton River. As a consequence of this, the gold-fish took up their quarters in the Croton and Hudson Rivers, and it was no unusual thing when the fishermen were drawing their seines in this vicinity, for a number of gold-fish to be among the fish taken. These were generally thrown back, but anyone on hand at the time could always procure what he wanted and I, at various times, picked out such as I chose. These fish had also from time to time been taken by boys to various ponds in the hills, so that there is no lack of gold-fish in the waters of West Chester County. I may here mention, that further up the Hudson River a similar fish-pond years ago gave way, well stocked with the European Carp that had been brought from Holland. These have also taken to the Hudson River and are from time to time netted there. Being of the same family, they have crossed with the gold-fish in breeding, and the result is that a mottled fish is frequently to be seen, some of which bear very little of the distinctive red that marks the gold-fish proper. I have seen the latter in the lagoons along the railway in that vicinity, eight or nine inches long, and although it may seem scarcely credible, I have seen them lying in shoals near the surface of the water on a bright sunny day, in such abundance that the surface appeared to assume where they were, a red tinge.

The Hudson River is famous for its eels, and small specimens of these were occasionally brought to me. A scoop-net, drawn through the liquid mud in any of the tide-water pools along the river margin generally brought up more or less small eels, so that a good selection could be made of the size best adapted for observation. From the experience I gained with them, I would never recommend more than one small eel being placed in an aquarium, as two which I first introduced took up their respective quarters at either end of the tank, and

were perpetually doing battle like knights of old, charging on each other most furiously, with the final result one morning of my finding both dead on the surface of the water, one of them having half swallowed the other, but the latter in the operation choked his conqueror, with the result mentioned. A subsequent specimen of mine was in the habit of secreting himself between two stones, with part of his body only exposed, as if watching everything. There is apparently much of the snake in their habits, and the same timidity exists in each. The least noise disturbs their equanimity and thunder seemed particularly to affect my specimen. Although he occasionally moved round in the daytime, night was the time for his activity, and the artificial light of a room seemed in no way to interfere with his apparent recognition of time. One eel at a time affords ample opportunities for studying the habits of that family.

One of the most interesting fish to watch, is the cat-fish, which I am seldom without, but it must be kept well fed, and even then the fins and tails of the other fish bear evidence of its attacks upon them. It is astonishing what an amount of food a cat-fish will swallow. You can watch his stomach swelling out to such an extent that it presents the appearance of a fowl's crop when fed to repletion. After he has thoroughly bloated himself out, he generally settles down, under or beside a stone, and lies there in a sort of comatose state for some time, closely resembling in this the serpent family. As soon as the effects of his meal have passed off, he becomes one of the most restless of the occupants of the aquarium, and swims backward and forward and up and down, incessantly, as if calling attention to his wants. I have not the slightest doubt that, after a time, fish know intuitively to a certain extent, when feeding time comes and the party that feeds them. I think that cat-fish are affected by, and feel coming changes of weather, but one cannot deduce conclusions from observations taken in a room where the temperature is probably uniform, as compared with the natural temperature out of doors.

Sticklebacks I have had in abundance, but more than two at a time become a nuisance. It is a perpetual warfare all round, especially if the males predominate. They, together with sun-fish, are, probably the most pugnacious of all fish, showing hostility even to my finger when

held towards them under water, their fins and spines bristling up like the hairs on a bull-dog's neck, when excited. They snap at everything, and it is impossible to keep any larvæ in an aquarium any length of time if these fish are joint occupants. I have read of sticklebacks building their nests and breeding among the weeds in an aquarium, but I never witnessed any operation of this kind myself, as I frequently changed my tenants for the sake of watching the habits of the different kinds of fish from time to time brought to me, with the exception of the gold-fish, which I have always retained.

Bass, I find to be for the most part, nocturnal in their habits, lying comparatively still the greater part of the day. Like the sun-fish, they are very tenacious of the spot they select, which they occasionally sail quietly round and round as if guarding, and woe to the unwary fish who may venture to settle down in the quarters they have chosen. The small brook sucker, I have kept and watched with a great deal of interest. They are useful scavengers, cleaning up, by suction, everything they come in contact with at the bottom, rolling it over their palate, swallowing whatever suits their taste, and thus disposing of a good deal of refuse matter which otherwise gives considerable trouble in getting rid of. These fish are, however, of what I might style, too delicate a constitution to be recommended as permanent occupants, Accustomed as they are to running water, and evidently given to roaming in streams, they seemed to suffer when pent up in a small space and except for temporary observation, I would not recommend their introduction into any private aquarium. Crayfish, in the same way, are very unsatisfactory occupants, and I never was able to keep one alive for any length of time.

One of the most interesting fish that I ever had in my aquarium was a small gar-pike, which was caught in a scoop net at the foot of the locks here in Ottawa and brought to me. This fish lived for several weeks, and after his death I placed him in spirits, where he still exists, He was most unsociable, turning his back upon all other fish that approached him, accepting the apparent overtures of none. The only surviving remnant of the fossil bony-scaled Ganoids of the Devonian rocks and belonging to the Mesozoic period, his pedigree probably caused him to look down on the finny tribe of the present age as his

inferiors. Hugh Miller, speaking of the living representatives of these fossil fish, says :—"They seem to have been spared amid the wreck of genera and species to serve as a key by which to unlock the marvels of ichthyology of those remote periods of geological history appropriated to the dynasty of fish." I am inclined to think that my specimen scorned the ordinary food of the other fish, and died from inanition, as I never could induce him, while I was watching, to approach while they were feeding, and if he did satisfy himself at all, it must have been under cover of darkness. However, as he did not appear emaciated at his death, he may have subsisted on animalculæ in the fresh water from time to time supplied. The ordinary pike and dorée I never attempted to keep, and it is almost needless for me to say that brook trout will not live in any ordinary aquarium. The "Shiner" is also too delicate for general keeping and requires highly aerated water.

I have had almost all kinds of small fry, known as "minnows," in my aquarium, consisting of young chub, dace and minnows. They are very lively and become in a short time accustomed to their confined quarters, but from their delicate formation I would never recommend them as permanent inmates. There is one exception, however ; that is the barred, or black minnow, which is very hardy and a very amusing fish to watch. Sometimes motionless on the bottom, as if wrapped in deep meditation ; at other times balancing himself in the water, he keeps up a continual flapping of his ventral fins, working them like a fly-wheel, with apparently no other object than exercise. At other times, he darts about from side to side, and if more than one of these minnows are occupants they seem to exchange ideas, as the rest of his own species sail about conjointly with him.

Moving about, as I have done, from place to place, my Aquarium occupying the safest place in my baggage and being the first thing attended to after unpacking, I have had opportunities of stocking it from various waters, and when I went to reside for a short time at Buckingham I obtained one day, when fishing in a little trout stream, back of the village, a small specimen of the Bull-head, one of the very few that I have ever taken. He was carefully consigned to my Aquarium but only lived a few days, owing probably, to his transfer from the clear, crystal waters of that running stream to the narrow compass of

still water, to which he was unaccustomed. He lay all the time ensconced between two small stones, hiding himself as closely as possible from observation, refusing food, and evidently sulking as wild animals do when first placed in confinement. The enormous size of his mouth as compared with his other dimensions, gave evidence of the capacity of these fish for disposing of a large meal at a time, but I never had the satisfaction of witnessing the operation of feeding, and I fancy from the retiring habits of the "bull-head" family, very little is really known about them.

Now leaving fish, I must dwell for a minute or two, on the amphibious denizens of the Aquarium. The Water Newt, Eft, and Triton, familiarly known as Lizards, although as repulsive as snakes to some people, afford much interest and amusement. I must confess I have never been fond of them, as I have a great aversion, inborn I suppose, to both lizards and snakes, but I have had Tritons in my Aquarium, as the cadets I spoke of, frequently brought them to me. The Triton is by no means shy, and is really grotesque in his movements, lying sometimes midway between the bottom and the surface, with all his legs spread out at right angles. At other times he suspends himself in the water, moving his feet up and down as a bather treads water, then darting frantically about with great rapidity. Occasionally he sits erect on the bottom of the aquarium, on his hind legs with his fore paws bent forward, like a dog begging. This position the Triton will keep for some time. He is also fond of resting on any portion of rock projecting out of the water, but if he can by any possibility climb to the edge of the aquarium, that is the last of him, as he is evidently of a roving disposition, and in search of the nearest road to liberty he is very apt to be crushed out of existence under foot.

The Tadpoles that were brought to me in every stage of growth, were, as the auctioneer says: "Too numerous to mention." I occasionally, to please the bringer, kept one or two for a short time, or till such period as their tails dropped off, at which stage of their existence, if I had not treated them myself to freedom, they would have gained it for themselves, as a frog in a state of maturity can only be kept in bounds by a fine wire grating laid over the aquarium, without which it is futile to keep them for observation. The tadpole, owing to the imperfection

of its gills has to frequently rise to the surface with a rapid zig-zag motion, something like an unsteady kite in the air. The process of change in these animals is very curious. The hind legs are the first to appear, and there is an interval, ranging from one to three weeks, before the fore legs push through the skin. Then the metamorphosis is rapid, the tail is absorbed and the final state of frog-hood is reached.

Among the respective inmates of the Aquarium, which were brought to me, was a small Turtle, about the size of a silver dollar, for whose benefit a small fragment of rock, projecting a little above the surface of the water, was provided, on which this animal delighted to sun himself whenever there was a chance, but at the slamming of a door, or even at the vibration caused by walking across the floor he would immediately slide off the rock, and swim violently about for a few minutes. He was not one of the "snapping" order, but black, with red marks on the under part of his shell. Turtles seem to be very susceptible to sound, and, apart from noticing ordinary noises as above mentioned, he had a habit of constantly turning his head from side to side as if listening. He was very ravenous, the food I gave him consisting of earth worms, and small pieces of raw meat. These he would hold with his fore paws while he pulled at them and occasionally shook them, much in the same way as a terrier does a rat. His end was like that of all pets. He contrived one night to creep out of the aquarium, got on the floor and was crushed by the heavy tread of a human foot.

Another inmate, whose movements I watched with great interest, was a leech; not one of the kind used by doctors, but that known as a "horse-leech." The movements of this creature were very interesting. Fastening himself on the side of the glass, he would swing his body backwards and forwards, elongating and contracting it by turns, in every direction, as if looking out for something, and when finally satisfied that there was nothing within reach, he would slide himself along the glass the length of his body when extended, and then again go through the same proceeding. I would not, however, recommend the introduction of leeches into ordinary aquaria, as the fish therein are sure to suffer from their attacks. These, however, seem to be made under cover of darkness, for I never saw my leech attack any

of my fish, though the death of some of them while he was an inmate, I attributed to his work.

A very interesting class of occupants are the so-called Fresh Water Snails, among which I have always preferred *Planorbis*, whose shell reminds one of the fossil ammonite, *Paludina*, or marsh agate shell, *Limnæa*, and *Physa*. These are all and each a study in themselves. Seen only in their native state they would seem to possess few points of attraction, but when under observation they are very different. The species of *Physa* and *Limnæa* have a curious habit of floating on the surface with shell downwards, propelling themselves by a wavy motion of the wing-like apparatus that encircles their body. They all multiply rapidly, attaching their eggs by a transparent substance to the glass, or to stems of plants, but the voracity of their co-occupants,—fish—seldom allows them to come to maturity, so that there is an alarming table of infant mortality amongst these shell-fish. The utility of these as agents in keeping down the green growth of *confervæ* in an aquarium is great and the way in which they clean the glass is most interesting. The occupant of the shell puts forth his proboscis, turning it apparently inside out as we do a stocking, until the silky surface, which is the tongue, comes in contact with the glass. It then makes a sweep, like a mower's scythe, taking up into a swath all the *confervæ* on that spot. The proboscis enfolds this, and the tongue takes upon it all the vegetation which it has collected and disappears in the animal's interior. A forward movement is then made and another portion of the glass is swept clean by the same process, so that the track of the snails upon the glass may be traced as distinctly as that of a mower, by his swath along a meadow. Although I have had what are known as "fresh-water clams," that is the *Unios* and the *Anodons*, as occupants, they are unsatisfactory, and if a person wishes to study their habits, I think they ought to have a receptacle for themselves. They require a muddy bottom in which to move, and their habits are so distinct and different from those of everything else that they would need segregation from other occupants.

Water Beetles are another interesting branch of life under water, but the larger ones are too voracious to be kept any length of time. I introduced the large Horny-cased, Black Water-Beetles (species of

Dytiscus), into my aquarium several times, but I found that they were given to roam by night; rising to the surface they would unfold the gauzy wings encased under the horny covering and take flight from the water, and would be found next morning somewhere about the room if there was no outlet, or attention would be called to their escape, from their flying about the room like a small bat. I may state here that it is not unusual to find these insects on our sidewalks at the foot of an electric light pole, to which they seem attracted by the glare. There is another Beetle (a species of *Acilius*) with a bronze casing, which is an interesting object, from its rapid motion and apparent game of hide and seek from stone to stone.

A few years ago, a specimen of *Menobranthus*, that curious batrachian with gills and breathing tubes protruding therefrom, was offered to me by a boy who had caught it whilst fishing in our Rideau Canal. Repulsive looking as these creatures are, I would have liked to have studied his habits, but the reptile had been so bruised that it was too far gone to make use of, and I have never since had an opportunity of obtaining one. These animals are numerous in the waters of the Ottawa, and are not unfrequently taken by persons bait-fishing. I have seen specimens in one or two windows in town here, but the pent up waters of an aquarium seem scarcely healthy enough for them, as I noticed their place was very soon empty.

I believe that it remains an open question as to what senses are possessed by Fish, apart from that of sight. There is every reason to believe that they possess the faculty of smell, for it is no uncommon thing when fishing to notice their manner of swimming round and about the bait that is used, bringing their heads in contact with it, even pushing it, which to my mind is evidence of their using their olfactory organs to help them thereby to ascertain the quality of the bait. Again, many fishermen use oil of aniseed and other essences on their bait, which they affirm have the property of attracting fish, and I myself have many a time noticed a fish after dallying with the apparently tempting looking bait and moving it with its snout, finally turn away as if in disgust. Sir Humphry Davy says he thinks the principal use of nostrils in fish is to assist the propulsion of water through their gills, but he thinks also there are some nerves in these organs which give a sense of the qualities of

the water or of substances dissolved in, or diffused through it, similar to our sense of smell.

With regard to hearing, it is very difficult to arrive at any conclusion, for what may be attributed in them to the sense of hearing is, in most cases, if not all, attributable to vibration. A sudden slam of the door, a clap of thunder, or a stamping on the floor will start into violent movement a fish lying perfectly still. I remember as a boy, standing by a fish pond, belonging to my father, (at which, by the way, before the days of aquaria, I picked up a good deal of knowledge on the habits of fish,) watching a shoal of roach sunning themselves on the surface. A dark cloud was speedily approaching, from which suddenly burst out a bright flash of lightning without in the least disconcerting the fish, but the instant the thunder sounded, they disappeared with a dive downwards, scattering in all directions, and I am very much inclined to the opinion that it is vibration or percussion alone that supplies to them what with us we attribute to hearing. Those who had the pleasure of listening to Dr. Powell's recent lecture on "Sound", will remember that his explanation of hearing was, that it is to a great extent, based on sound vibrations conveyed through our organs of hearing, to the brain.

The vision of Fish is peculiarly acute. This is known to all fishermen, who, on a sunshiny day carefully avoid letting their shadow, or even the shadow of their rod fall upon the water. I have seen trout dart from cover to seize a bait floating midway down the stream and before they had reached it suddenly turn back, deterred from their object, either by a shadow cast on the water, or by a sight of a man on the bank. When a strange fish is put into an aquarium, he at first avoids showing himself in the open when an observer is by, but when he becomes accustomed to frequent visits he seems to have no objection to a stranger and swims about unconcernedly.

Fish exhibit an inquisitive turn of mind. If a new pebble is dropped into an aquarium they watch it from a distance, evidently with great curiosity. After a while they will swim around it at a respectable distance, till one of them, bolder than the others, makes a dash at it immediately rejoining his fellows. Then one or two will swim round and round it, gradually approaching nearer to it, till finally they come in contact with it and, when satisfied that it is an object of no harm,

they then pass and repass it without any further apparent notice. Again when fresh plants are placed in an aquarium, they will swim in and out of them in every direction as if to satisfy themselves that they are really plants. Another curious thing that I have noticed is that, when fresh clean sand is deposited in one spot, they are very fond of balancing themselves over it in an almost perpendicular position, drawing in, by suction, a mouthful of it, which they convey to another spot and there deposit it, carrying on this operation till quite a quantity of the sand has been removed. This apparently curious habit I attribute to their propensity for preparing in their natural condition, a fitting repository for their spawn.

Whether Fish have taste or not, is I think past our comprehension but I am inclined to the idea that they have for we all know that when one bait fails to attract, another will often prove attractive, and the only reason one can naturally assign for that is that it is one more suited to their taste.

I should like to say something about the diseases to which Fish, pent up in aquaria seem subject, but although I have suffered from time to time by apparent epidemics, I am not able to pronounce any deductions from these losses. Only this winter I record the loss, one after another, of some 12 or 14 minnows which I obtained in October last, and which remained thoroughly strong and lively till the early part of January, when they commenced to sicken and die two or three a day till the whole disappeared. The water was regularly changed and they were properly fed, but some evident epidemic had taken possession of the shoal, as happens among the human race. The symptoms were an apparent enlargement of the head, with protrusion of the gills, and loss of color in the tail end of the body. The air bladder was evidently affected as they first kept on the surface, then lost their power of balancing themselves and within twenty-four hours, died. Two small minnows which have occupied the aquarium since the previous winter escaped, and are still alive.

I have noticed that in a majority of the deaths amongst my Goldfish, a peculiar fungus-like growth covers the gills, sometimes both, sometimes only one gill. This seems to come on in the last stage as it does not show when they first sicken. The early symptoms are violent restless.

ness, darting to and fro, even knocking their heads against the glass as if delirious ; then loss of balance, the air bladder loses its power and the victim lies on its side with the tail bent downwards as if contracted by spasm, sometimes for two or three days. I have tried everything ; change into warm water ; change into very cold water, and I once tried the effects of bread crumbs soaked in wine (a remedy used in Germany to revive carp when transported for long distances) but all to no effect and I have now come to the conclusion that man cannot prescribe for the denizens of the water, the conditions of life being with them so utterly different from other animal life. The apparent attack of an epidemic amongst fish, which is known to take place in their natural habitats, is only part of that law of nature which subjects life of every description to attacks upon it.

Goldfish are naturally long lived and I have had specimens for ten years at a time, in perfect health. The limited space of an aquarium seems to dwarf their growth and size, as they certainly do not attain to their full proportions half as rapidly as in open waters. Catfish, when grown too large for their quarters, I have frequently taken to the nearest stream and they swim off as unconcerned as if always accustomed to liberty. An aquarium owner soon comes to regard its inmates like all other pets, and it may be said in their favour that they do not require anything like the attendance needed for other living pets. The loss of them is in certain cases more difficult to replace as you cannot always obtain, at the time, a specimen of the kind perhaps most wanted.

There has been great discussion as to the best aspect in which to place an Aquarium, and opinions are varied, but the conclusion I have arrived at is, that a northern aspect is desirable, a southern aspect is worst, and the western nearly as bad, as the sunlight falling on it materially assists the green coating caused by the growth of *confervæ* on the glass. The bottom, which ought to be, if possible, of slate, should be covered with small pebbles or fine gravel about an inch in depth, leaving a small patch for clean sand. Earth is not required, as water plants mostly grow floating. A few pretty stones or a little rock-work should be added with a part of the latter projecting above the water for the purposes already alluded to, especially if fish only are to be kept, as the latter delight in loitering in the friendly shade of a rock. Besides the pleasing appear-

ance afforded by water plants, the purpose of vegetation is to decompose the carbonic acid gas thrown off by animals, the carbon being absorbed into the substance of plants, and the oxygen set free for animal life. Even a growth of *confervæ*, unsightly as it is, is conducive to this. In a large Aquarium, a lily may be introduced, planted in a shell or small pot, hidden by weeds, but any plant that grows above the water is apt to aid any creeping animal to effect his escape. The whorled millfoil is one of the best plants for general use as it prefers still water, and I have succeeded, by inserting it late in the fall, in keeping it through the winter in sufficient quantity to answer all purposes. The goldfish and others of the Carp family, nibble at it, and it is probably as essential to their welfare as vegetables are to man. *Valisneria* is a clean, sightly plant and answers well as an air provider, besides being one of the few plants which afford a microscopic view of the circulation of the sap in the leaves.

There is a pleasure in connection with keeping an Aquarium, that to a lover of Nature, adds materially to the charm that attends the observation of its inmates, and that is the rambles made to collect various specimens of aquatic life. The keen lookout for water snails amongst the vegetable growth at the bottom or on the surface of some stagnant pool, and the eagerness to get the little scoop net over one, perhaps just out of reach, affords a pleasure, equal to, if not surpassing that felt by the sportsman beating the bush for game, or the fisherman eagerly watching his bait. The health-giving stroll along the bank of some tiny streamlet, on the lookout for minnows or larvae or any of the varied inmates of its waters, is far different from the monotonous constitutional, along the dusty highway, of the man who has never read a page out of Nature's book of life. The most important principle, perhaps, in life, is to have a pursuit, a useful one if possible, and at all events an innocent one. The scenes you enjoy, the contemplation to which they lead and the exercise attendant on specimen collecting are salutary to the body as they are to the mind. I always find a peculiar effect in such outings; they carry me back to early times and feelings, and create afresh the hopes and happiness of youthful days. Could we all recover anything like that freshness of mind possessed in youth, which, like the dew of morning covered all objects, and in which they

were more beautiful than even in midday sunshine, what would we not give? Rambles with an object go far to bring back the spring of early life.

In conclusion, I will quote the words of Sidney Hibbard, in an Article on the subject of this evening. He says:—

“The Aquarium introduces us to new scenes, hitherto hidden from our view, and makes us acquainted with the economy of creatures of whose very existence, many of us, not altogether unlearned in the history of the world, were previously ignorant. Their habits of feeding, moving, and burrowing, their battles, their change of form, the display of even a strange intelligence working its way by wonderful means to wonderful ends, impress the observer with the idea of the boundlessness, the variety, the adaptations and resources of a world brimming with life, in all manner of strange forms and developments. Here we see them equipped and armed for battle against each other, the strong destroying the weak, yet each contributing its part to the preservation of the whole, just as in all other departments of Nature, the great balance of perfection is sustained by incessant and intestine war; the struggles of opposing elements and powers and beings, all working mysteriously in a manner independent of isolated circumstances, Nature, the prodigal mother, setting no value upon individuals, but regarding tribes and races as paramount, the whole seeming confusion tending to one end; the revolution of the mighty wheel on which the creatures are painted as signs and in which ages are but minutes in a revolution which itself is eternity. In the midst of all, everlasting Wisdom watching, loving and sustaining; happy we to get some glimpses of His method of working through the medium of the strange creatures which leave the mysterious deep to throw a new radiance on our homes.”

### "THE BIRDS OF MONTREAL."

We are pleased to notice the promised publication of a new work on local ornithology under the above title. The author, Mr. Ernest D. Wintle, is an Associate Member of the American Ornithologists' Union, and has devoted ten years of special study to the bird life of his district, the results of which, with the records of previous observers, ought to furnish materials for a pretty full list as well as many interesting facts of life history. The author promises 251 species and sub-species. The work is to be descriptive and illustrated; and, treating of a district whose bird-life is in most respects similar to that of Ottawa, will no doubt furnish a convenient and useful hand-book to the students of Ornithology among the members of the Ottawa Field Naturalists' Club. It is with pleasure we add that Mr. Wintle himself is one of our members.—A. G. K.

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### EXPERIMENTAL FARMS.

The Annual Report of the Government Experimental Farms, recently issued, is of special interest to us as the Central Farm is located at Ottawa and its officers are active members of the Field-Naturalists' Club. The Reports consist in all of 289 pages. In the first 54 the Director, Prof. Saunders, concisely outlines the operations of the various farms, and the numerous experiments with wheat and other crops. Prof. Robertson, as Agriculturist, follows with 30 pages (the space allotted to each of the officers,) on experiments in dairying, feeding stock, fodder-crops, etc. The Horticulturist, Mr. Craig, figures some new native plums and grapes, and discusses the treatment of the fungous diseases affecting various fruits. The Chemist, Mr. Shutt, gives very valuable analyses of various fodders and fertilizers, also of well-waters submitted by farmers, and the results of experiments with fungicides. The Entomologist and Botanist, Mr. Fletcher, treats carefully of the Hop-vine Borer, the Red Turnip Beetle, the Western Blister Beetle, the Birch Bucculatrix and of various parasites. He also treats of the Potatoe-rot and experiments for its prevention, and of Lawn and Fodder-Grasses. Mr. Gilbert, as Poultry Manager, details his experiments with various breeds, and the relative values of each. To the

foregoing very interesting and instructive reports are appended those of Messrs. Blair, Bedford, MacKay and Sharp, Superintendents of the respective Branch Farms at Nappan, N. S., Brandon, Man., Indian Head, Assa., and Agassiz, B. C.—ED.

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### SIR RICHARD OWEN.

By the death of Sir Richard Owen, of the British Museum, not only has England lost one of its ablest scholars in the realms of science, but the world mourns a prince amongst naturalists. Of genial temperament and generous heart, ever ready and willing to assist in the furtherance of science and scientific research, Sir Richard earned for himself a reputation and a name which place him for ever among the fathers of vertebrate palaeontology. On "Fossil Mammalia" "Fossil Reptilia," "Dinosauria," "Cetacea" and numerous orders of vertebrata, he wrote works which will remain as monuments to his scholarly attainments and natural abilities. In the field of Canadian paleontological literature he has left interesting memoirs. The earliest of these was an elaborate paper, beautifully illustrated with large folding lithographic plates, published in the Quarterly Journal of the Geological Society of London. This dealt with the tracks or trails of marine animals in the Potsdam Formation of Canada. The specimens from Beauharnois and other localities which Sir William Logan placed in his hands were admirably described and now adorn the walls of the National Museum on Sussex street, with the names which Sir Richard gave them. These "foot prints" or 'ichnites' have been greatly admired and are much sought after by collectors and museums. His other papers were on the Reptiles of Eastern Canada. His descriptions are clear and the facts well defined and presented. Britain owes a great debt of gratitude to the departed naturalist and it is gratifying to see that at a meeting presided over by H. R. H. the Prince of Wales it was agreed to erect to his memory a monument to be placed in the spacious Entrance Hall of the British Museum. His Royal Highness paid a personal and high tribute to his deceased friend, and Lord Kelvin, (Sir Wm. Thomson), Thomas Huxley, Sir Wm. Flower, and many others spoke at length on the loss which science had sustained.

H. M. AMI.

## CONCHOLOGY.

I am very much pleased to be able to record an addition to the list of Ottawa land shells :

In May, 1890, while searching for specimens of *Pupa Armifera*. Say, near the railway bridge on the Hull side of the Ottawa River, I found a number of Pupæ, which at the time I considered to belong to some form of *pentodon*.

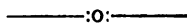
A few weeks ago I sent some of the shells to Dr. Sterki, and he has returned them marked *Pupa Holyingeri*.

*Holyingeri* and *pentodon* are very similar in size, color and arrangement of the "teeth," but differ in shape.

*Pentodon* tapers rapidly, the apical whorls being much narrower than the later ones.

*Holyingeri* is cylindrical, being of an almost uniform width throughout.

Dr. Sterki tells me that he now considers that *pentodon* and its ally *curvidens* belong to the genus *Pupa*, and not to *Vertigo*, to which genus they were removed, I think on his authority, a few years ago.—GEO. W. TAYLOR, Victoria, B.C.



## THE ROYAL SOCIETY OF CANADA.

The twelfth Annual Meeting of the above Society commenced on Tuesday, May 23rd. After routine business, the Reports from the associated Societies were read by the Delegates present. The Ottawa Field-Naturalists' Club was represented by Mr. Shutt. In the afternoon Dr. Kingsford read a paper *in memoriam*, on the late Sir Daniel Wilson, and one on the late Mr. Gisborne was read by Sir James Grant, after which there was a short but most enjoyable "At Home" given by Mr. Sanford Fleming, C.M.G. The Presidential Address by Dr. Bourinot, C.M.G., delivered in the Normal School at 8 p.m., was a masterly treatment of "Our Intellectual Strength and Weakness," and was listened to with the closest interest by all who were present. After the close of the lecture, Dr. Bourinot had a most charming "At Home" at his residence. On Wednesday, at the close of the morning session, the Fellows and

Delegates accompanied the President to the office of the Governor General, and presented to His Excellency a Farewell Address, to which he made a very able and sympathetic reply. The several sections met, but as it was the Queen's Birthday it was largely observed as a holiday. A sub-excursion of the O.F.N.C. was organized in the afternoon, for the benefit of Section IV, and a very pleasant visit was made to the woods near Hemlock Lake. The excursion was brief, to enable the participants to attend the delightful "At Home" given by Sir James and Lady Grant. On Thursday morning the sections completed the reading of papers and election of their officers, and in the afternoon the officers of the Society were elected as follows: Pres., Dr. Geo. Dawson, C.M.G.; Vice-Pres., Mr. Lemoine (Quebec); Sec., Dr. Bourinot, C.M.G.; Treas., Dr. Selwyn, C.M.G. In Section IV, Geological and Biological Sciences, with which our interests are most closely allied, the officers are as follows: Pres., Prof. Macoun; Vice-Pres., Mr. Fletcher; Sec., Prof. Penhallow (Montreal). Fourteen papers were presented in this section. The Presidential Address, by Mr. Whiteaves, dealt with the Cretaceous rocks, which are largely developed in the North-West Territories and British Columbia, and which have yielded many interesting fossils, and minerals (such as coal) of much value. Mr. Whiteaves also read a paper on some new fossils from the Trenton limestone of Manitoba. Three other papers were presented by members of our Club, viz.: "The Geology of the Proposed Tunnel under the Northumberland Strait between New Brunswick and Prince Edward Island," Dr. Ells; "Sponges from the Pacific Coast of Canada," Mr. Lambe, and "Canadian Uroceridæ," Mr. Harrington, (present as Delegate from the Entomological Society of Ontario.)—Ed.

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#### EXCURSION No. II, TO ROCKLAND.

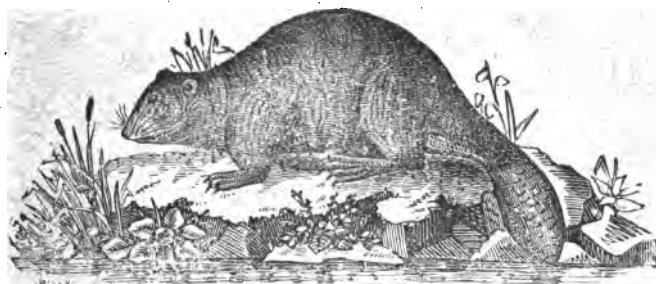
It is proposed to hold the Second Excursion on June 17th, down the Ottawa to Rockland, Ont., a locality not yet visited by the Club, and which is highly recommended by the Excursion Committee. The Steamer Empress leaves the Queen's Wharf at 7.20 a.m. The price of tickets will be twenty-five cents.

Excursion to Borthwick's Springs, July 8th.—See Notice Page 68.

July, 1893.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 4.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued June 30th, 1893.

Published Monthly at \$1.00 per annum.

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Monthly parts, 10 cents ; to members, 5 cents.

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## FOOD AND ALIMENTATION.

L. COYTRUX PREVOST, M.D.

*Read January 19th, 1893.*

I most sincerely thank the officers of this Association for having conferred upon me the honour of reading a paper before the "Field Naturalist's Club," which possesses, among its members, names already illustrious.

I am happy to have the opportunity of contributing, as far as my feeble means permit, to the achievement of its aim, which is intellectual progress and advancement of science.

The physician, gentlemen, has another role to play on earth besides relieving or curing the evils that afflict our poor humanity. His duty, above all, must be to ward off diseases, in pointing out their causes and the best means of avoiding them.

These causes, alas ! are manifold. They accompany man from the cradle to the tomb ; they surround him at his birth, escort him all his life, being for him a perpetual threatening. But the most common, undoubtedly, are those which arise from some disorders of the digestive system.

It is by the digestive tube that life enters our body, and by the digestive tube also that enters death.

The intestines and the stomach can be considered as true laboratories where the most deadly poisons are incessantly produced. Nature, it is true, has provided us with powerful means of defence, but, some day, the foes will swarm and overcome the barriers opposed to them by physiological laws ; disease then is constituted with all its sufferings and dangers.

These disorders, in the greatest majority of cases, are owing to ignorance or contempt of the laws of hygiene. It is, therefore, our duty to teach these laws and point out their importance.

In preparing this paper, gentlemen, I dreamt a moment of trying to dazzle you with the depth of my science. I had almost made up my mind to enter into transcendent considerations upon the physiological machinery of nutritive phenomena, penetrating the essence itself of the

composition of the tissues of human organism, endeavoring, in short, to create an imperishable monument worthy of being preserved in your archives, for the greatest glory of its author and the amazement of posterity. But - - - I changed my mind; the scientist yielded to the hygienist's more practical obligations. I generously sacrifice, therefore, my ambitious and legitimate aspirations to simply try to be useful. I merely want to speak of alimentation, explaining, by the way, the phenomena of digestion and the rules which must preside to its normal working.

At first, gentleman, "*noblesse oblige*." You have done me the honour of inviting me to lecture before you, I do not wish to remain in debt of courtesey: I invite you to dinner, here and now—But I must tell you that it is going to be a mere intellectual banquet, excellent means of avoiding indigestion and cramps in the stomach, you must confess.

Therefore. let us sit down to table; here is the bill of fare, the simple lecture of which will make your teeth water:

*Bill of Fare.*

Oysters in shell. Sauterne. Chablis.

SOUP:

Pea with crumbs. Sherry, Madeira.

FISH:

Fried Haddock. Fresh boiled Salmon.

ENTRÉES:

Chicken with truffles. Omelette with ham. Veal chops, tomato sauce. Chateau Lafitte.

ROAST:

Tenderloin steak. Roast beef. Mutton chops. Pork chops. Apple sauce. Ve. Clicquot.

RELEVÉS.

Black Duck. Patridge on toast. Chambertin.

VEGETABLES:

Potatoes a la Lyonnaise. Sweet corn.

FRUIT:

Pears, apples, oranges, grapes. Cheese, milk, porridge. Bread, butter coffee. Chartreuse.

Now, you must admire, gentlemen, the intelligence which presided at the confection of this truly royal bill of fare. It is the deed of a thorough "*gourmet*" and also of a friend who aims at your most perfect gastronomic welfare and of a physician who attended to all the requirements of hygiene.

"But," some of you will say, "your bill of fare contains indigestible ingredients: I never can taste such and such dish without experiencing the most violent indigestion." Let us explain ourselves.

There are no indigestible aliments, in the etymological sense of the word. All eatable substance is digested, more or less completely, if you like, and more or less rapidly, but it ends always by going through. The word "indigestible" is relative and if any one hears again in a rather disagreeable fashion, of what he has eaten, it is because this unfortunate individual is ill, or the privileged possessor of some peculiar idiosyncrasy which departs from the general rule.

But as I consider you all as I wish you to be, that is, perfectly sound and devoid of all caprices as far as your material organization is concerned, I am convinced of having found for the composition of this repast, the most agreeable and most nutritive aliments.

I said "agreeable" because we never do well but what we do with pleasure. In fact, let you sit down to table with an anxious and pre-occupied mind, the stomach will pout for your paying such a little attention to the fulfilment of its functions and will punish you with indigestion, for having diverted, for the benefit of the brain, the concentration of energy which it has a right to claim when it is its turn.

A meal may be a regular work, but that work must be recreative and one cannot exaggerate the importance of dining in good company, and, besides, food must be artistically prepared in order to be palatable and stimulate the appetite. This accounts for my calling forth all the secrecies of culinary art to impart to my bill of fare the most irreproachable character.

At last, you must remark that the dishes are numerous and varied in order to supply the tissues of organism with the whole scale of the elements they want, for their intimate rebuilding. In fact, all aliments do not possess the same nutritive value and the same digestibility and the most nutritious are not always those we digest the most easily.

The aim of alimentation is to supply the animal economy with the principles it requires for the production of its energy, and with the primordial elements which directly or indirectly go to the repair or growth of tissues. The more an aliment contains of these elements in quality and quantity, the greater is its nutritive value.

In the admirable paper read before you last year, your worthy vice-president has made you acquainted with the principles which constitute the chemical composition of our body. Here they are briefly enumerated : Oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, calcium, sodium, potassium, magnesium, chlorine, iron and fluorine.

These elements are found in various combinations with one another and form nitrogenous and non-nitrogenous compounds, carbo-hydrates and salts. They enter into the composition of all the tissues of the body. Since food is destined to the rebuilding of those tissues, it is evident that the ideal aliment, the perfect type, would be the one into the composition of which would enter in the meantime, all the chemical elements I have enumerated. But that ideal does not exist. There are, for example, nutrients which contain a considerable proportion of nitrogen, making them eminently proper to repair the tissues, but which, on the other hand, possess too small a quantity of carbo-hydrates to meet the wants required by respiration and the production of animal heat. Others, while they are rich in carbon and hydrogen, are very poor in azote. Hence, the necessity of a mixed alimentation to properly supply nutrition with all its requirements.

Formerly, primordial foods were divided in two classes, namely : the plastic and the respiratory aliments.

The plastic aliments were constituted by albuminous substances to which the name of quaternary was given, because they possessed a more or less great number of atoms of oxygen, hydrogen, carbon and nitrogen. They were found in almost all the tissues and fluids of the body, forming the base of muscular tissue, gelatine of the bones, fibrin of the blood, casein of the milk, albumen of the egg, gluten of the bread, etc., etc. Respiratory aliments, so called because they are used for respiration and are consumed in the body, formed the base of fats, sugars and feculents.

For this altogether theoretical division, we have nowadays substitute d

another more in harmony with the modern teachings of physiological chemistry, and we divide the primordial elements of food in two great classes, namely, the organic and inorganic principles. In the latter class enter the salts and water, and the organic compounds are considered under two divisions: nitrogenous and non-nitrogenous.

It is to the groups of organic substances that belong the albuminoids, the chief flesh formers of our body. Still, in spite of their great nutritive value, these albuminoids, taken separately cannot alone sustain animal life and in order that they should acquire a real nutritive value, it is necessary that they must be associated, not only to the other substances of other classes of food, but even to the different kinds of albuminoids themselves. For instance, an animal fed on albumen or on gelatine alone, would very soon succumb, as it has been demonstrated by Papin, Magendie and Hammond's experiments.

Now, gentlemen, the food which contains the greatest quantity of nutritious substances is not always the one that is digested the most easily; on the contrary, we shall see that certain very nutritious aliments are of a slow and painful digestion. We must acknowledge, besides that several causes bring modification to the precise rules that we might establish with regard to the digestibility of food; it would be difficult nowadays to classify alimentary substances into light and heavy aliments. One of the chief objections to this classification would be individual predisposition. In fact many would easily digest foods which would infallibly produce indigestion in others.

We must add to this: Habit, which permits the digestive tube to get accustomed to such and such aliment.

But there is a point upon which physicians and physiologists agree; it is the importance of the state of cohesion, and the looser is that cohesion the easier is the digestion. There exists, in the same substance, very wide differences, according to the different states in which that substance is presented, and nothing is more interesting than the results given by Schiff upon the digestibility of a given quantity of albumen taken in solid and compact mass or else administered finely divided.

Digestive value and nutritive value of food, are therefore two different things and we could say with Trousseau: "That the most

digestible food is that which supplies the body with the greatest quantity of reparative elements, requiring in the meantime the less possible exertion from the digestive functions."

Now that we have made these few restrictions, perhaps it would not be without interest to examine the experiments made to determine the digestibility of food and the conclusions arrived at on the subject.

• Were the human body transparent, it would be an easy matter to follow the phases which alimentary bolus undergoes from the moment it is formed in the mouth until it has given up all its nutritive particles in the depth of the digestive tract. If the Creator, instead of kneading our body with clay, had made our tissues in crystal, anybody would, at a glance, determine the precise moment that the mouthful of bread, the piece of meat cease to be what they were, to become absorbable paste. But the opaque substance, of which our integuments are formed, hide to our view the phenomena that take place within ourselves, and we have to resort to certain crafts in order to uncover the mysterious operations of the digestive system.

For instance, Spallanzani would introduce alimentary substances in tubes or hollowed balls which he would make his patients swallow. When these balls would be returned, either by vomiting or by a more indirect way, he would examine the modifications undergone by the substances contained inside.

But we may easily understand, that as these foreign bodies were rejected at indeterminate hours, it was difficult to obtain, by these experiments, anything like serious and reliable results.

Gosse, of Geneva, was endowed with a peculiar privilege : he could vomit whenever he wanted to. He availed himself of this talent to study the degree of digestibility of foods. He observed that the substances which he would most easily digest, that is, within one or two hours, were : Fresh boiled eggs, milk, lamb, veal, fresh fish, gruel, potatoes. He would take four to six hours to digest : pork, hard eggs, oysters and pastry—other substances would remain very long in the stomach such as : rind of pork, orange peels, mushrooms.

I must confess, gentlemen, that we cannot grant much credit to these experiments, deprived as they were of the accuracy exacted by a truly scientific method. But it is not so with regard to the knowledge

supplied by the phenomena observed in individuals bearing gastric fistula. Amongst these observations, there is one renowned above all, and cited everywhere, I mean the case of the Canadian, Alexis St. Martin, related by Dr. Beaumont. That celebrated patient received one day a shot wound in the pit of the stomach. Fortunately for the man and for science, the wound did not prove fatal, but the result was an opening which never closed and established a permanent communication between the outside and the stomach. Dr. Beaumont, during several years, studied the functions of digestion on this robust Canadian. He would make him swallow all kinds of food, watching their exit on a level with the artificial opening and could then calculate the time taken by alimentary substances to undergo a complete digestion in the stomach. He made us know the results of his experiments in a rather curious table of which I will give you a brief abstract. He observed that the following foods were completely digested at the end of the periods mentioned :

Rice.....	1 hour.	Fried oysters .....	3 hrs. 15 m.
Boiled milk .....	2 hours.	Roast beef .....	3 hours.
Roast turkey.....	2½ hours.	Beefsteak .....	3 “
Boiled turkey.....	2 hrs. 44 m.	Boiled beef.....	3½ “
Boiled goose.....	2½ hours.	Roast mutton .....	3 hrs. 15 m.
Suckling pig.....	2½ “	Roast veal .....	4 hours.
Fresh lamb .....	2½ “	Boiled fowl.....	4 “
Fresh eggs, boiled hard.....	3½ “	Roast duck.....	4 “
Fresh eggs, boiled soft.....	3 “	Roast pork.....	5 hrs. 15 m.
Fresh eggs, raw.....	2 “	Sausage.....	3 hrs. 20 m.
Fresh eggs, fried .....	3½ “	Bread .....	3 hrs. 30 m.
Salt codfish .....	2 “	Boiled potatoes .....	3 hrs. 30 m.
Salmon trout.....	1½ “	Fried potatoes .....	2 hrs. 30 m.
Oysters, raw.....	2 hrs. 55 m.	Boiled cabbage.....	4 hours.
Oyster soup .....	3½ hours.		

The experiments of Dr. Beaumont on his Canadian were made as well by Ch. Richet on a man named Marcellin upon whom Surgeon Verneuil performed a gastric fistula. I do not wish to enter into the details of this case which I mention only on account of a curious fact that happened with that man, Marcellin, a fact showing how hard it is, sometimes, to resist the impulse of a passion even in spite of the greatest obstacles to its gratification.

Marcellin, aged 17 years, swallowed by accident on the 4th February, 1876, a solution of caustic potash. The most intense inflammation followed, and brought on the obliteration of œsophagus. He could therefore no more be fed in any manner whatever. Verneuil saved his life, in making in the pit of the stomach an opening through which they then introduced the solid and liquid foods necessary to his subsistence.

This poor man at last died of consumption brought on, do you know by what cause? He was deprived of œsophagus, and consequently could not drink, but this did not prevent his becoming a drunkard: he would introduce, through his fistula, the alcoholic beverages which took him to his grave.

But let us return to our bill of fare, gentlemen, I want to say a few words of the ingredients of which it is composed. To facilitate this description allow me to somewhat alter the order of their disposition. Let us divide them all, at first, in two classes: the solids and the liquids. Amongst the solids we shall examine meat and vegetables, sprinkling afterwards this dry subject with milk, broth and wine. But enough of words, time has come to act—Waiter—bring on the oysters.

Oysters, gentlemen, contain carbon, nitrogen, salts and water and constitute a very useful aliment, easily digested, provided that they are eaten raw. Fried or in soup they are a great deal more indigestible. William Roberts has tried to give the explanation of this fact. The small yellowish mass which is called the “eye” and which is the most palatable part of the oyster, is the liver—which is but an agglomeration of glycogenic substance. That liver during life contains, besides a digestive ferment, the hepatic diastasis. By the mere fact of mastication, these two substances are brought in contact, so that the glycogenic is immediately digested by its own diastasis.

Raw oysters therefore digest themselves without any other intervention. This advantage is annulled by cooking, because the heat, even moderate, destroys the ferment associated with the glycogenic substance. According to Roberts, alcohol has the same inconveniences, so that we should not drink any wine while eating oysters and be satisfied with milk, which did not prevent my ordering Sauterne to sprinkle these delicious mollusks. It is the fashion, do you see. In France and in Canada amongst those who eat “à la Française” white wines are indispensable with oysters.

(Continued on page 69.)

REPORT OF THE ORNITHOLOGICAL BRANCH FOR THE YEAR 1892.  
*To the Council of the Ottawa Field Naturalists' Club:*

LADIES AND GENTLEMEN,—The Leaders in Ornithology in presenting their report for the year 1892 have to regret that in the section of the work under their oversight there has not been so much activity shown as in some former years. But four observers have reported, and the total number of species recorded reached only 118. None of these were new to the list but a number of previously doubtful records have been corroborated.

The department of "Editorial Notes" in the Naturalist has contained from month to month items in connection with bird-life deemed of sufficient interest for publication, and these need not be recounted here. In addition to these the following records are worthy of notice:—

Field sparrow, *Spizella pusilla*, 2nd July, about 4 miles south-east of King's Mountain; in full song and evidently breeding, though nest not found (F. A. Saunders).

Tree sparrow, *S. monticola*, 8th January, on the "mine road" north of Hull (F. A. Saunders). This species, common enough in the season of migration has never before been known to winter with us; indeed there is said to be but one previous record of its appearance during winter anywhere north of latitude 44° (Cooke's Bird Migration Miss. Valley).

Wood thrush, *Turdus mustelinus*, 26th May, near McKay's Lake (A. G. Kingston), and 29th June on King's Mountain (F. A. Saunders).

Blue-grey Gnatcatcher, *Poliophtila cerulea*. Previous to this year there has been but one record of this little bird for this locality—about 12 years ago. This year it is reported twice, once on 26th May by Mr. Kingston and again on 10th July by Miss Gertrude Harmer. No specimen was secured, however, and at most the visits of this resident of the Alleghanian district to our neighborhood must be regarded as merely casual.

Common tern, *Sterna hirundo*, 11th August near Brockville (Miss Harmer). Though somewhat beyond our limits, the appearance of a flock of these birds at a point so far from the sea and the great lakes is worthy of note.

A. G. KINGSTON, }  
 JOHN MACOUN, } *Leaders.*  
 WM. A. D. LEES, }

## ORNITHOLOGY.

EDITED BY A. G. KINGSTON.

*Winter visitants.*—The winter of 1892-3 was marked by a great scarcity of bird life in the neighbourhood of Ottawa. Irregular and uncertain though the movements of the winter birds always are, it is seldom that the winter season passes without the appearance of some one or more species in considerable numbers. Probably these visits depend more upon food supply than upon the mildness or severity of the temperature; but in both of these respects our district showed itself last winter a very inhospitable quarter for the birds. The weather here, as throughout the whole of North America was marked by unusual and almost unbroken cold; and as the rowan-berry crop of 1892 had been a total failure, with tamarac cones and cedar seeds much below the average, the “visible supply of breadstuffs” for the feathered population must have been alarmingly short.

Of Crossbills, Redpolls and Pine Siskins there have been no reports whatever. The Purple Finch which is usually fairly well represented throughout the winter in suitable localities did not put in an appearance until the 4th May, and the Goldfinch came seven days later, after having donned his summer plumage elsewhere. A few straggling Pine Grosbeaks, (one 25th January), and an occasional small flock of Snowflakes (one 11th February) were the only representatives of these frequently abundant species.

It is often asserted, however, by ornithologists that in their favorite study, at all seasons and in every locality, the diligent student is sure of some reward, and that there is much truth in this claim the following further records will show:

*Robin.*—One seen 18th January on Wellington Street, by Prof. Macoun. Mr. Fletcher also reports one, a fine male, in Archville on 12th March, and another has been reported as appearing several times in New Edinburgh. It is possible that all these records refer to the same individual—perhaps a wounded bird that was unable to undertake the hardships of migration, and was yet so fortunate as to find food throughout the severe weather.

*Prairie Horned Lark.*—(*O. alpestris praticola*). On 27th February three or four were seen along the roads on the Experimental Farm.

The next day several appeared, and during the milder weather of March they were abundant.

*Blue Jay*.—15th February.

*Canada Jay*.—(*Perisoreus Canadensis*). 15th February (A. G. K.) about 25 miles up the Gatineau.

*Chickadee*.—18th February.

*Crow*.—As for this sable scavenger, he is always to be found where there is work for him to do; and the enterprising local reporter who at any time during the long winter is in want of material for an item headed "Harbingers of spring" has only to visit the neighbourhood of one of the slaughter-houses beyond the Rideau river, in order to be favored with a sight of, and if the weather is mild, perhaps even a "caw" from one or all of the proverbial black three.

*House Sparrow*.—It has been a matter of general remark that the "English Sparrow" population suffered heavily during the past winter. Apparently their numbers on the opening of spring did not exceed one third of what they had been when the first snow fell. It is worthy of record that the first to disappear under the severe weather were the albino specimens referred to in these notes in October last. Not a single case of albinism has been noticed since 1st January. The first brood of young sparrows, however, is now (15 June) on the wing, and as each pair of old birds raises three or four families in a season there is no doubt that they will have replenished the earth ere October returns again.

*Spring Migration*.—This is not the place to publish a list of spring arrivals. Suffice it to say that although the opening of vegetation this year was unusually late, the birds do not seem to have delayed their movements much on that account. The Robins and Song Sparrows appeared in small numbers on the 24th March, then retired before a short spell of cold weather, and returned again in force on the 29th, when they were accompanied by the Blue-birds. The Bronzed Grackle arrived on 2nd April and the Redwing Blackbird on the 3rd. Turning to the Swallows, an unusually early appearance of the Tree Swallow (*Tachycineta bicolor*) was noted on 1st April by Mr. W. A. D. Lees and several other observers. No other tree swallow was reported until 22nd April. Purple Martin 2nd May; Barn Swallow 5th May.

## EXCURSIONS Nos. I AND II.

The first excursion for the present season was held on May 27th and proved very successful, there being three hundred members and their friends present. The point selected was the village of Wakefield, or La Pêche, and the Gatineau river, at the height of its spring flood, afforded some fine views as the train skirted its rapids and falls. The morning was bright and clear but unfortunately before noon it clouded up and showers and light rains continued during the afternoon. In spite of the moisture, however, many of the collectors continued their explorations and some good botanical collections were made. Two prizes which had been offered by the Council were awarded to Miss Blaikie and Mr. McCurdy for their very creditable collections. The adjacent school-house gave shelter to many during the day, and probably had within its walls a more learned and scientific body than on any previous occasion. The excursion cars also formed a rallying point, and in them were delivered the usual interesting addresses by Dr. Ells and Messrs Ferrier, Craig and Cowley, the leaders of the Geological and Botanical sections. Ed.

The second Excursion was held on Saturday, the 18th June, and those who attended spent a delightful day. After a pleasant sail down the Ottawa on the fine Str. Empress, the party on reaching Rockland was met by a steam launch, on which a short cruise was made among the adjacent islands and bays. Then the quarries were visited, from which is being excavated the stone for the Soulanges canal, and which furnish a very fine, massive limestone. The geological exposures of this neighbourhood are exceedingly interesting, several formations being visible, and good series of fossils were obtained from the various strata, of which notes will appear later. The members were then conveyed in carriages to Mr. Edwards's splendid farm, and they were much interested in the fine stock exhibited. The neighbouring fields and woods were found to be most inviting; strawberries were abundant, and various flowers in profusion. During the afternoon the mills were inspected and the river banks examined. The thanks of the Club are due to Mr. Edwards, M.P., for his kind invitation to visit his extensive mills and farms, and for placing his launch and carriages at the service of the members. Also to Mr. Archie Stewart, who has the contract for

the canal for which the stone is being taken out, and who very generously provided a bountiful supply of fruits and refreshments. Mr Angus McLean kindly escorted the party, and Mr. Gardner, the Superintendent of the quarries, was most obliging in describing the operations.

### SUB-EXCURSIONS.

The continued rains and unpleasant weather of the early spring months rendered it often impossible to hold the regular Saturday afternoon outing, but members took advantage of any propitious days. A very pleasant visit was made on May 20th, to the Beaver Meadow, Hull, and many interesting plants and insects were obtained. Among the more conspicuous plants which were in charming profusion, and of which several fine nosegays were gathered, may be mentioned Trilliums, (white and red) Uvularia, Dicentra (Squirrel-corn, very abundant,) Dentaria and Violets of several kinds. A nice addition to the Ottawa List of Coleoptera was made by Master T. MacLaughlin who captured a fine male of *Dicelus teter*, Bon. Among the Carabidæ captured may also be noted *Calosoma frigidum*, Kirby and *Harpalus vulpeculus*, Say.

The Mer Bleue, a favorite resort of our botanists, was visited on June 3rd and the masses of bloom which decked the surface of the "Big Swamp" gave it a most attractive appearance. Among the more showy plants growing around the borders or scattered among the prevailing *Cassandra calyculata* (Leather-leaf) mention may be made of *Menyanthes trifoliata* (Buck bean), *Kalmia glauca* (Sheep Laurel), *Pirus arbutifolia* (Choke-berry), *Andromeda polifolia*, with its lovely delicate blossoms, *Vaccinium corymbosum* (Swamp-Blueberry) and three species of Eriophorum (Cotton Rushes) one of them (*Eriophorum russeolum*) being new to our local flora. Insects were not abundant but several interesting species were taken, including two examples of a previously unrecorded butterfly, (*Thecla angustus*.)

Casselman which has always proved a rich collecting ground was visited on June 10th, by a strong botanical contingent among whom was Prof. Fowler, F.R.S.C., of Queen's University, Kingston. As usual the party was well rewarded by the occurrence of many fine plants including the following additions to the local lists :—*Polygonatum giganteum*, *Polygonum erectum* and *Phragmites communis*. Some of the party went on three or four miles, where the land becomes swampy as

at the Mer Bleue and offers almost the same plants. *Cypripedium parviflorum* was abundant, but the flowers were mostly faded, and *Lonicera oblongifolia* occurred in great profusion. Those who remained at the river obtained among other fine plants *Cypripedium acaule* and *Orchis spectabilis*. Insects as on the previous Saturday seemed unusually scarce, but towards evening the Black-flies and Mosquitoes were sufficiently abundant.

Some members, lovers of botany and the muses, made a trip to North Wakefield on the 18th June, for the purpose of visiting a swamp discovered last autumn to contain great numbers of the Showy Ladies-slipper (*Cypripedium spectabile*). The display of these lovely plants was even more extensive than had been expected, and charmed and delighted the party, who returned laden with spoil.

#### VALUABLE EXPERIMENTS.

Mr. Frank T. Shutt, M.A., chief chemist of the Dominion experimental farms, read an interesting paper at the recent meeting of the Royal Society, descriptive of a preliminary series of experiments with the object of ameliorating certain alkaline soils in Manitoba and the North-west territories. He opened by drawing attention to the occurrence of the "alkali patches" in many parts of these provinces. These patches or barren spots, which vary greatly in extent, always occupied low places or natural depressions in the soil. In dry weather they were covered with a white incrustation, but when moist the affected soil was usually black. Apart from the presence of the injurious chemical, analysis had shown these alkali soils to possess all the elements of fertility. Complete analyses of the three samples of soils—supposed to be typical of these spots—were given. They showed that in addition to comparatively small quantities of salts of soda, a considerable amount of magnesium sulphate (Epsom salts) was present. To get rid of the soda salts, thorough drainage was instanced as the most effective means. The soda salts were usually either carbonate or sulphate—the latter was not as injurious as the former. The use of an application of gypsum had proved efficacious to soils impregnated with carbonate—which was thereby converted into the less injurious form of sulphate. To ascertain the effect of magnesium sulphate on vegetation, Mr. Shutt

had carried out a series of pot experiments with corn, wheat and peas. The results showed clearly that this chemical proved most disastrous to vegetation. He therefore inferred that in many instances the sterile character of the soil was due in part, and in some instances, perhaps, wholly to the presence of magnesium sulphate (Epsom salts).

Elaborate pot experiments were then instituted with wheat, peas and corn, to find out if the addition of (a) carbonate of lime and (b) lime to a soil containing magnesium sulphate would render this substance non-injurious and allow the plants to come to maturity. While the carbonate of lime proved beneficial, lime proved much more so. During the course of the experiments careful records were made at intervals of a week, and mathematical plottings of these were shown to the meeting. Photographs, also illustrating the growth of the plants in the treated and untreated soil, were exhibited. The chemistry underlying the changes induced in the alkaline soils by these remedial agents was explained. The value of lime in improving soils impregnated with magnesium sulphate was fully established by the scientific data here brought forward.—*Toronto Empire*.

(In our brief report of the proceedings of the Royal Society we were able only to refer to the papers read in section IV, and we therefore reproduce with much pleasure this abstract of the paper presented to Section III by our Delegate. Ed.)

## FLORA OTTAWAENSIS.

BY JAMES FLETCHER, F.R.S.C.

The annotated list of the Flora of the Ottawa district which was begun three years ago in the *Ottawa Naturalist* and the completion of which was unavoidably delayed, first of all by illness of the writer and afterwards by press of official work, will be completed in this volume of the *Naturalist*. Members will please observe that the sheets issued with each number are unattached and that the pagination begins at page No. 78 in continuation of the part issued with the May number 1890. Some members will receive the forthcoming sheets who were not subscribers to the Club when the former parts were issued. They may perhaps be able, with a little enquiry, to procure the first 77 pages from some members not specially interested in Botany.

## ENTOMOLOGY

Edited by JAMES FLETCHER, F.R.S.C.

*Meloe-niger*, Kirby. The Black Oil-beetle makes its appearance in the first sunny days of spring, while the snow still lingers in shady corners, and may often be seen crawling on the city sidewalks, apparently having issued from the adjacent lawns. There are certain sections of sidewalk upon which they may then be captured daily. This beetle is easily recognized by its abbreviated elytra and absence of wings; its colour is a greenish black. W. H. H.

*Toxotus vittiger*, Rand. A specimen of this pretty longicorn was beaten from Oak at Casselman, on June 26th, 1883, and on the 10th of present June, Mr. Fletcher secured a dozen specimens flying about, or on the flowers of *Osmorrhiza longistylis*, in the same locality. W.H.H.

*Donacia pubescens*, Lec. This distinct species appears to be local, and to appear early in the season. In 1878, Mr. Fletcher took six examples near Billings Bridge, and it was not collected again until this June, when it was specially looked for in the same locality, and several specimens were taken by sweeping bullrushes (*Typha*) and grasses along the banks of the Rideau river. *D. jucunda* and *D. subtilis* were abundant, and a few *D. proxima*, which is more abundant later in the season, and frequents the lily pads. W. H. H.

*Sphinx Kalmia*. I have received from our Canadian veteran botanist, Mrs. C. P. Traill, of Lakefield, Ont., now in the 93rd year of her age, a fine specimen of the Lilac Sphinx, *Sphinx Kalmia*. Mrs. Traill also writes a long and interesting letter on the Holy Grass (Indian Sweet Hay,) *Hierochloa borealis*. The bed of this grass on the Experimental Farm is now a mat of flowering stems, and well worthy of a visit from our botanists. J. F.

## EXCURSION No. III, TO BORTHWICK'S SPRINGS.

A Saturday afternoon Excursion will be held on the 8th July, to Borthwick's Springs, by special invitation of Mr. Borthwick. The Club vans will leave the Post Office at 2 p.m. *sharp*. The price of tickets has not been definitely fixed, but will probably be 25 cents.

August, 1893.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 5.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:  
PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued July 31st, 1893.

Published Monthly at \$1.00 per annum.

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Monthly parts, 10 cents ; to members, 5 cents.

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## FOOD AND ALIMENTATION.

BY L. COTEUX PREVOST, M.D.

*(Continued from page 60.)*

Personally, I do not know whether these lovely drinks really have a pernicious influence upon the "eye" of oysters, but all I can say, is that everytime I perchance witnessed any indigestion brought on by this association of wines and oysters, it was that the quantity of liquids ingulfed had been totally out of proportion with the laws of sobriety, required by any reasonable stomach.

Mussels (*Mytilus edulis*) are not generally known in Canada, at least in restaurants. In France they delight those who are really fond of delicious eatables. But if ever your good fate takes you to Paris, beware of what they call there: "Moules a la Marinière."

If you should forget this wise advise you might pay dearly the satisfaction of your legitimate curiosity. I saw some of my friends twisted by the most excruciating colics, accompanied with an abundant rash of urticaria, owing to their having eaten but a few mussels. In Ireland, these shells seem to be less poisonous. In 1874, I had just arrived in Dublin, where I entered the Rotunda Hospital as resident pupil. One evening towards 10 or 11 o'clock, I was leaning on the window sill of my room thinking of my absent native land, when I heard a strolling dealer bawling out his goods, contained in a basket suspended to his arm. Impossible to understand what he was offering from door to door. "What is he saying?" I asked my room companion. "This is the Cockle dealer" he answered. These Cockles are mussels which delight the people in Dublin. Every night they constitute the family revel, every body eats them with a glass of sherry wine and I never heard that they had the reputation of being hard to digest.

While we are under water, gentlemen, we must not get out without saying a word about fish.

As far as digestibility is concerned, fishes may be divided in 3 groups: those with white flesh such as trout, haddock, etc., they are the most digestible, but the least nutritious; those with yellow flesh, such as salmon are of a slower digestion but contain more nutritious principles; thirdly those with fat flesh such as eel, very nutritious but hard to

digest. It has been contended that exclusive fish alimentation might have some inconvenience, namely that of producing cutaneous diseases—do not believe it; still it is absolutely necessary that fish should be eaten perfectly fresh. Of all animals fish is the one which most quickly putrifies. Twenty-four hours after death, there takes place in their tissues a development of enormous quantities of toxic substances the adsorption of which may give rise to the most serious disorders in the digestive tube.

I have very little to say concerning fowl and game. Game, however, offers special conditions to which Gubler has called our attention. You are aware that some kinds of game are very often brought on the table in a state of incipient decomposition. This condition is a sort of fermentation which has a certain analogy with the fermentation that takes place in the stomach, and owing to this fact, according to Gubler, assists the work of digestion. But that putrifaction must not be too far advanced or else it will introduce in the system toxic alkaloids, as will fish, and these cadaveric substances may then cause fatal results. Bronardel, for instance, has cited cases of people dying after having eaten tainted game pie. At any rate, as far as I am concerned, I vote for fresh things—and the duck as well as the partridge that I ordered on our bill of fare are of an irreproachable freshness. Taste them without fear and sprinkled with a glass of good Chambertin I promise you ineffable pleasure. For it is with game that Burgundy wine must be drunk.

With regard to fowl, let us speak of eggs, that precious and complete food above all others. I say complete food, that is containing associated all the substances necessary to the nutrition of our tissues. Eggs contain nitrogenous compounds, such as albumen (vitelline); fatty substances (margarine, oleine) and salts. Should we compare the quantity of nitrogen, carbon, fat and water contained in eggs and milk, we shall find that an egg weighing for instance 50 grammes is equivalent to 100 grammes of cow's milk.

Eggs are generally very well borne by the stomach, they are easily digested. But we must remark the considerable influence of cooking upon this kind of food. A fresh egg, boiled only a few minutes is rapidly peptonized, being completely digested within  $1\frac{1}{2}$  or 2 hours, as

showed by Dr. Beaumont, whereas a hard egg has hardly undergone this process at the end of three hours and a half. Must I add that it is of the greatest importance that eggs should be perfectly fresh? For choice, look through the egg, fresh eggs are more transparent in the centre, old ones at the top. Dissolve one ounce of salt in ten of water, good eggs sink, indifferent swim, bad eggs will float even in pure water.

Amongst the preparations having eggs for base I want to particularly point out what is called "American Cream." It consists in beating two yolks together, in adding some powdered sugar and then flavouring with rum or sherry. This mixture is very easily digested and exceedingly nutritious. You may conceive how precious it is for sick persons as well as for weak stomachs which require a strengthening food under a small volume. This mixture constitutes also the first meal recommended by Coats in training pugilists. I regret, gentlemen, that time and the limits of this paper do not permit my saying a few words upon this marvellous method employed by sportsmen in their training for competitions.

I heard, in Paris, Professor Bouchardat speak most emphatically of the excellence of alimentary diet, united to exercise, used by these athletes to obtain that perfect ponderation of muscular powers which permit their going everywhere and disputing prizes in races, on foot or horseback, rowing, fencing and boxing. He contended that these trainers knew and applied better than anybody the laws of hygiene the observance of which is the *sine quâ non* condition of perfect health.

Here we are now, gentlemen, at the solid joints of our bill of fare, that is the meats of mammals, such as beef, mutton, pork and veal. Those are the aliments to which is entrusted the repairing of our tissues, owing to the large proportion of azote they contain. According to Beaumont, the most digestible meat is that of mutton, then beef and lastly pork. But the age of the animal bears a considerable influence upon digestibility: for example veal is more digestible than beef, lamb more than mutton. I mean, of course, the digestibility and not the nutritive value of these nutrients, or else the order would have to be changed. In fact adult animals are those that give the most nutritious meats. According to Payen, the composition of roast beef cut up in slices three centimeters thick, is as following:

Water .....	69.89	Fatty substances.....	5.19
Albuminates .....	22.93	Mineral matters.....	1.05

Muscular flesh contains, besides free lactic acid and sulphur united to the nitrogenous organic compounds, mineral matters constituted by salts formed out of the bases, potash, soda, lime and magnesia united to the phosphoric, lactic and muriatic acids.

Roast meat is far preferable to boiled, not only on account of the preservation of the nutritive qualities of the meat, but also, owing to the development during cooking of certain odoriferous nitrogenous principles such as osmazone, which render these meats palatable.

Since I mentioned boiled meat, it is impossible not to say something of broth, a preparation which has given rise to rather interesting discussions; certain physicians praising, others denying its nutritive properties. Schiff's experiments, however, permit our deciding this question. This physiologist has demonstrated that the secretion of gastric juice is not indefinite and that it suffices to give a dog, with an empty stomach, a considerable quantity of meat to see, under the influence of this exaggerated alimentary mass, the secretion of gastric juice dry up. Food, then, acts as a real foreign body and is consequently thrown up. This state is known under the name of indigestion *a crapulà*. But, and here is a very interesting remark of Schiff, it suffices to introduce into the circulation certain substances to immediately cause the gastric juice to be secreted anew, at the surface of the gastric mucous membrane. Among these substances, dextrin appears to possess this property to the utmost, and on animals thus crammed with food and in whose stomach gastric juice is no more secreted, it suffices to introduce a dextrin solution, either in a vein or in the rectum, to promote the immediate digestion of that excess of alimentation. To those peculiar substances, Schiff has given the name of "peptogenes," that is, substances promoting the secretion of gastric juice and therefore the conversion of albuminoids into peptones. Well, gentlemen, broth precisely contains almost exclusively these peptogenous compounds, and the secular tradition of eating soup before meals, receives in the discoveries of modern physiology a resplendent confirmation. Not very nutritious by itself, since it contains a very feeble

quantity of organic matter, hardly 16 p. 1000, and an enormous proportion of water, 985 p. 1000, broth helps the digestion of food in rapidly penetrating into the circulation and bringing back the materials necessary to the secretion of gastric juice.

Therefore, if I am allowed to offer you here a practical advice as a conclusion of what I have just said, I will give you the following : If ever it is your misfortune to suffer some day from bad digestion, before exposing yourselves to be stuffed up by all the drugs invented of late to cure dyspepsia, try a cup of good broth before or after meals ; others have often derived much benefit from this practice and the experiment is inoffensive and certainly worth trying.

In spite of the nutritive value of the aliments we have just examined, they cannot exclusively compose the food destined to repair the waste of the organism. If meats possess the advantage of containing a large proportion of nitrogen (albuminoids) on the other hand, they are deprived of starch and carbohydrates which we are compelled to ask of the vegetable foods, characterized by low albuminoids and high carbo-hydrates. The vegetable kingdom will supply us with flour, bread, vegetables and fruits, and if you want to form an idea of the nutritive value of these nutrients, allow me to place before you the composition of some of them. For example, wheat flour contains :

Water.....	14.0 per cent.
Fatty Matters.....	1.2 “
Nitrogenous substance insoluble in water (gluten) .....	12.8 “
“ “ soluble in water (albumen) .....	1.8 “
Non-Nitrogenous substances (dextrin) .....	7.2 “
Starch.....	59.7 “
Cellulose.....	1.7 “
Salts .....	1.6 “

Oatmeal, out of which porridge is made, contains 63 parts of starch, and 12 per cent. of nitrogenous substance, that is, almost as much as muscular flesh of animals. Peas contain 22 per cent. of proteic compounds, and 53 per cent. of starch.

Among usual alimentary compounds, the most important is without doubt bread. The whitest is the most nutritious, and the crust

has a more considerable nutritive value than the pith, as you may judge by the following table :

Water.....	Crust = 17.15	pith = 44.45
Insoluble nitrogenous subst.....	" = 7.30	" = 0.92
Soluble " ".....	" = 5.70	" = 0.75
Soluble non-nitrogenous ".....	" = 3.88	" = 3.79
Starch ...	" = 62.58	" = 43.55
Fatty substances.....	" = 1.18	" = 0.70
Salts.....	" = 1.21	" = 0.84

Potatoes for 100 parts contain 2 parts of nitrogenous substances and 21 of carbo-hydrates. Rice has 5 parts of albuminoids and 83 carbo-hydrates.

Among the fats I shall mention butter, which contains 91 per cent. of fatty substances ; cheese, which contains 24 per cent. of fat, besides 33 per cent of nitrogenous substances.

My intention is not to dwell at any length on fruits, wishing only to remind you that they introduce into our economy salts of sodium and potassium, useful to nutrition, and since I am speaking of salts, I wish to point out the importance of common salt, and of all mineral matters in alimentation. These substances are just as necessary as the reparative and respiratory aliments. Forster has given pigeons, mice and dogs a food very poor in mineral matters, and he has observed that mice lived 21 to 30 days only, pigeons 13 to 29 days, and dogs 26 to 36 days.

According to Barbier, man must take daily within 24 hours, 12 to 20 grammes of salts, either pure or mingled with food. When for one reason or another man cannot take the necessary quantity of salts, the same accident happens as with other animals, he falls into a state of weakness and languor, offering, after a while, all the symptoms of anemia, owing to the diminution of albumen and blood corpuscles.

With regard to the importance of salts in alimentation, I cannot resist the desire of saying a few words about "scurvy," a disease I particularly studied within the last few years. This disease, which formerly was the terror of navigators, exists nowhere, so to speak, except in Canada, where it pretty severely treats, almost every year, the raftsmen who spend the winter in the midst of our forests. You have all heard of that disease called "blackleg" by our "voyageurs," which 20

or 25 years ago was a regular plague, as it would strike down 25 or 30 men in a shanty composed of 40 individuals.

Nowadays, we meet almost every spring with a certain number of cases, but it has become a good deal less common, and shows a tendency to disappear. What is the cause of this consoling diminution? Formerly, our forests, so rich in wood, were poor in settlers. Food intended for the shantymen was exclusively bought in cities, and consisted of salt pork and beans. As clearings allowed settlers to establish themselves, farms were created on almost every limit. On these farms, vegetables are being cultivated, especially potatoes, with which the shantymen can easily be supplied for their alimentation. Those who are to-day the victims of scurvy are those who winter in the remotest parts, away from established settlements. Do you know to what treatment we subject these unfortunate patients suffering from black-leg? We actually stuff them with potatoes and other fresh vegetables, and in a few weeks they are perfectly cured.

The general opinion to-day is that scurvy proceeds from the privation of vegetables, and that these vegetables possess anti-scorbutic properties, owing to the salts of potassium they contain. Here it is curious enough to remark, that these salts of potassium exist in vegetables in a special chemical state which causes all their efficacy. In fact, mutton contains by ounce 0.846 of salts of potash, and besides, you are aware that the pork destined to shantymen is generally salted with nitrate of potash. Still, in spite of this alimentation, scurvy soon appears. What can be the reason of this apparent contradiction?

Here it is: Salts of potash in food, as all the mineral salts, must be introduced on determinate chemical forms in order that these principles may be fixed in sufficient quantity by the functions of assimilation. Thus, phosphate, nitrate of potash, and chloride of potassium traverse the whole system, and are expelled almost entire through the excretions and secretions of the body. These salts are stable. On the contrary, in a combination of potassium with an organic acid, such as the citrates, nitrates and tartrates, the organic acid is decomposed, giving up carbonic acid, and the economy finding itself in possession of a salt of little stability, nutrition takes up and utilizes its base. Fresh green vegetables contain potash combined with organic acids, which

are thus decomposed. Meats, on the contrary, contain phosphate or nitrate of potash, which are stable salts. These facts explain why mutton, although containing a certain amount of potash, is unable to prevent scurvy, whereas lime-juice, for instance, with an equal quantity of this base, but in the state of super-citrate, acts as a true specific in the prevention of this disease.

One word now, with your permission, about milk and wines ; because however succulent may be all the dishes we have spoken of so far, it seems to me that the subject is rather dry, it wants liquids. Milk, like eggs, is what we call a complete food. It contains albuminous substances ; casein and lacto-protein and albumen ; fatty matter the butter ; a sugared substance, lactose ; saline principles, phosphates, and chlorides, and lastly water. Its digestion is most rapid, it is the food most quickly absorbed, requiring in the mean time the least digestive work possible. We must add that it is the nitrogenous compound which contains the smallest quantity of toxic alkaloids.

Its nutritive value is certain. Unique aliment of the child during the first months that follow its birth, milk supplies it with all the materials necessary for a rapid growth. Even with adults, milk employed alone suffices for their alimentation, and we often observe that certain patients fed on strict milky diet obtain by it a sufficient nutrition. Lastly, it is an admirable therapeutic agent in some diseases of the stomach. In ulceration of that organ, for instance, milk given exclusive of all other food and even without any drugs whatever, acts in a truly specific manner

I have, in the course of this paper repeatedly spoken of toxic alkaloids, products formed during digestion in the stomach. I think it proper to dwell a moment upon these curious phenomena which, although within the province of pathology, still have a proximate relation to alimentation and the functions of the digestive tube. You have all heard of microbes, and bacteria ; micro-organisms, the discovery of which has had such an influence upon medical doctrines in general and the theory of infectious diseases in particular.

It is to Pasteur that we owe the wonderful discovery of the role played in our planet by a whole world of infinitely small beings which, everywhere invisible and present, constitute by the manifestation of their

incessant activity, one of the greatest forces which govern matter and determine its transformations. In applying all the faculties of his deeply investigating mind to the study of these infinitely small beings, much more powerful than the antediluvian monsters and often much more dangerous, M. Pasteur has succeeded in watching them at work in catching the play of their functions and in establishing their relations to the phenomena of fermentation of which they are necessary agents.

These micro-organisms swarm by millions in the atmosphere. They lie everywhere ; our clothes, our furniture, our books, the walls, the hangings of our houses are covered with them. The water we use for our ablutions, the water which purifies, as we fancy, the things it washes, the water we drink, how many microbes does it not contain and nourish ? Miguel has demonstrated that a single glass of Seine water contained 300,000 microbes. Evidently, all these micro-organisms are not malefactors : many of them are, on the contrary, for us very useful auxiliaries, others are quite harmless or indifferent. But mixed with these indifferent germs, there exists around us an immense quantity of them which are formidable. Such are the germs of infectious and contagious diseases, especially during epidemics.

These ferments, introduced with food into our stomach, feed themselves upon what we have prepared for our own nutrition ; they are our guests, our parasites, and live upon the portion of our aliments which we do not consume, clients who eat the leavings of the table. A great number of them are immediately killed by the chlorhydric acid of the gastric juice ; among those remaining some work for us, playing an important role in the digestive transformation of alimentary substances, but more often they openly work against us.

It has been thoroughly demonstrated by recent investigations, that the pathogenic microbes secrete, by the fact of decomposition produced by their vital action, special toxic substances, real nitrogenous bases similar to the alkaloids extracted from vegetables, such as quinine, morphine, strychnine, which dissolved in the fluids of the organism produce a true poisoning. It is they which incessantly fabricate in the digestive tube compound ammonia, such as indol, leucin, tyrosin, phenol, scatol. Carbonic acid and other gases are set free, such as for example, sulphurated hydrogen, and the products secreted by these

ferments, after their penetration into the economy give rise to the manifestations of a real poisoning. Such is the explanation of the strange phenomena offered by those who suffer of what is commonly called gastric embarrassment, indigestion, biliousness, flatulence, dyspepsia. To prevent this state of things we have a double means at our disposal : destroy the microbes by intestinal antiseptics and expel them from the alimentary canal by purgatives.

Here we shall remark how much the interesting researches in putrid fermentations of the intestines justify the traditional medication of our forefathers, and the physicians ridiculed by Molière were not altogether wrong after all, when they gave so much importance to the reiterated expulsion of atrabiliary humours upon which depended most of the evils that afflicted their clients.

But that is not all; there is something better than to cure an evil when it has been produced ; the ideal is to prevent it. Well, it is a known fact that animal food, such as meat and fish, is the aliment that contains the greatest quantity of germs: moreover, we may consider all albuminoid compounds as the most favorable soil for the origin and development of ferments ; consequently for the production of these toxic alkaloids.

You may, perhaps think that these considerations upon such a wonderful subject as bacteriology, have altogether made me forget our bill of fare. Not at all, and you will see that the conclusion of what I have just said will naturally bring me back to the starting point of this long digression. In fact, if we ever should find ourselves in presence of these disorders commonly called flatulent dyspepsia our first duty may be the getting rid, by the free administration of purgatives, of the morbid products gathered in the stomach. But this is not everything; we must above all suppress from alimentation all albuminoid food, since it constitutes the *materia prima* of this excess of morbid fermentation.

Still the patient must be fed. Here is where the usefulness of milk comes in, since that aliment is a complete food, as I have already said, since it is the nitrogenous nutrient which contains the smallest quantity of toxic germs. By the administration of this precious liquid food, we shall have suspended all mechanical work from the suffering stomach, which will be then in the position of a broken arm laid at rest

in a splint. Besides, the suppression of albuminoid food will prevent the development of further fermentation and allow the digestive functions to be restored to their normal state. This is what we are doing every day, and we may say that we possess in a milky diet the most powerful and efficacious means of treating and curing that so common disease called dyspepsia.

As far as wines are concerned, you may see that I have given them a large share in the drawing up of my bill of fare. And I believe that I showed proof of extensive artistic knowledge about the choice and distribution of their different kinds. White wines strike up the march and sprinkle the soup and fish; Bordeaux wines accompany the solid joints; Burgundy wines are associated with game, and Champagne with the dessert. All these wines are endowed with particular *bouquets* according to their variety, but the principle base of every one is alcohol, which enters into their composition in the proportion of 7 to 15 per cent. They contain also tannic acid and salts of potash, etc. Absorbed in small quantities during meals, it is a known fact that they possess a salutary action in assisting the secretion of gastric and pancreatic juices. And they contribute to cheerfulness of mind and consequently place the guests in excellent moral disposition, banishing from their brain all cares and preoccupation, which, you will confess, is worth consideration.

We know now, all the ingredients composing our alimentation. Here they are briefly enumerated:—

1.—Albuminoids, especially derived from the animal kingdom and the principal element of which is nitrogen united to carbon, hydrogen and oxygen.

2.—Ternary substances containing only carbon, oxygen and hydrogen without azote, they are represented by sugars and feculents.

3.—Fats deprived of oxygen, being consequently composed of carbon alone and hydrogen.

4.—Salts, which we meet in food supplied by both the animal and vegetable kingdoms. These are the materials destined to the nutrition of the body.

Now, what is the want of the organism? The human body is a living machine having two different kinds of functions *viz.* the *functions*

*of relation*, such as intellect, sensation, locomotion and voice and the *organic* or *vegetative functions*, as digestion, absorption, respiration, circulation; secretion, nutrition and calorification. These functions are what we call life. Life means movement, which again is but a transformation of forces contained in nature. These forces are concealed in a latent state in food, and their transformation into movement takes place within the body by means of the digestive functions. Feculents and sugars are consumed and provide animal heat, albuminoids and salts are fixed in our tissues and repair the wastes produced by use. Lastly fats, which have escaped oxidation are stored in the body and kept as a reserve for further and unforeseen wants of the organism.

Among substances destined to repair the incessant loss of the animal economy, some are directly absorbed and carried at once into the circulatory torrent; others deposited at the surface of the digestive organs, must undergo the influence of juices which are poured in and are modified so that they may be absorbed. This is the reason why food introduced into the mouth successively travels over the different parts of the digestive tract, being subjected by the way to various mechanical actions, but especially to the action of varied fluids.

Let us take, if you please, the alimentary bolus. Follow me, we shall accompany it in its pilgrimage into the depths of the digestive tube and see what will take place. Let us suppose this alimentary bolus composed of albuminoids, feculent and fatty substances. Once introduced into the buccal cavity, it finds itself in presence of a special liquid called saliva. The latter contains a ferment named ptyaline, which, while deprived of all action upon fats and albuminoids, possesses the property of converting feculent substances into dextrin, rendering them, therefore, assimilable. Hence, the necessity of thorough mastication of all starchy and sugared food, in order that these compounds shall be well impregnated with saliva. Hence again the dyspeptic disorders arising with people deprived of suitable teeth, as well as those who eat as if they were pursued, allowing no time for this important function to properly take place.

Arrived in the stomach, the alimentary bolus meets with another liquid, the *gastric juice*, which, like saliva, contains a ferment called *pepsin*. The latter's task is to digest albuminoid substances, which it

transforms into peptones, a product eminently assimilable. These peptones still possess some of the chemical characters of albuminoids ; they give, for instance, with nitric acid, a yellow precipitate of xanthoproteic acid, but they have lost the property of coagulating under the influence of heat or acids. Besides, when an albuminoid substance is injected into the veins of an animal, it is found again in the urine, but it is not so with peptones, which are absorbed into the economy, and of which no traces are found in urine, a proof that they have been thoroughly assimilated.

So far, feculent and albuminoid compounds alone have undergone the action of digestion, fats are intact. But when once it has been expelled from the stomach, the alimentary bolus, softened, modified, reduced to the state of pulp, meets in the first parts of the small intestines, another juice supplied by a gland called the pancreas. This fluid plays in digestion a considerable role. Its ferment, "the pancreatine," possesses the property of completing the digestive action which began in the buccal and gastric cavities. It modifies not only feculent and albuminoid compounds, which escape the action of saliva and the gastric juice, but it possesses besides the exclusive power of digesting fatty substances. Defresne, who made a careful study of the properties of pancreatic juice, attributes to three distinct ferments the threefold properties I have just mentioned ; *Amylopsine* would have the charge of converting starch into sugar ; *Steapsine* would favour the emulsion of fats ; lastly, *Myapsine* would dissolve albuminoids.

After having undergone the action of pancreatic juice, the aliments start on their way through the small intestines. As they progress, their consistency increases, while in the meantime their mass diminishes, owing to the greater part of them being absorbed by the chyloferous vessels. The excrementitious portion traverses the large intestine to be evacuated *per anum* ; the absorbed portions pass through the mesenteric glands to the thoracic duct, and are finally poured into the left subclavian vein, where they are mixed with the blood. They will hereafter belong to that regenerating fluid, which enters every organ, through the circulation, distributing the nutritive principles to every texture, and becoming the source of every secretion.

Gentlemen, in my quality of physician and hygienist, I do not

want to terminate my lecture without pointing out a common error committed in our alimentation in general, an error just as prejudicial as possible to the health of those who render themselves guilty of it, and they are the greatest number.

You undoubtedly know Count Tolstoi, that remarkable Russian writer, who within the last few years, has astonished the literary world by the originality of his characters and the boldness of his theories in social economy. He seems to have imposed upon himself the task of regenerating society, morally as well as physically, and lately he wrote peculiar articles which everywhere provoked a certain emotion. In fact this celebrated philosopher, falling upon the idols that man worships the most, emitted with his usual daring spirit the three following propositions :

1.—Luxury is bad. 2—Our alimentation is too abundant. 3—We must replace our animal alimentation by a vegetable one.

Naturally we have nothing to do with the first part of his thesis, but with regard to the second proposition, I subscribe to it with both hands. Yes, *we eat too much*. Almost everybody eats more than his hunger commands, and how many in presence of a good dinner leave the table only when it is impossible for them to eat any more? The old maxim should never be forgotten that “we must eat to live but not live to eat.” And do you know how little one need eat not merely to live but even to live comfortably, and to secure for the body the necessary materials for daily work? If we compared the quantity of food which suffices a poor peasant and the food necessary to the wealthy citizen, we would feel tempted to say that they were beings of different species. The fisherman is satisfied with a piece of bread and cheese and the tourist who accompanies him takes with him a whole kitchen paraphernalia.

The Arabian who guides the excursionist through the desert requires for food but a little bread and a few dates and it is not without a certain expression of contempt, that he considers the baskets of provisions, the cans of preserved meats and other innumerable ingredients that the sportsman thinks necessary to take along with him under fear of starvation.

Sheriff Sweetland, one night at a meeting of the Medico-chirurgical Society, caused no little amazement, in stating that the cost required for feeding a prisoner did not exceed 8 cents a day, that is 3 cents per meal.

He added, that being one day in England, in the course of a conversation with some officers of the London jails, these officers had found the sum exorbitant. They said that each prisoner in London did not cost them, for food, more than 4 cents daily. "If we fed them, they added, at the rate of 8 cents, as you do in your country, our jails would soon become insufficient to receive the mass of those who would rush in solely to be fed in such a luxurious manner."

These examples suffice to demonstrate how few aliments are required to keep life and repair the wastes of the organism. Twenty grammes of nitrogen and 300 grammes of carbon are all that is wanted ; or in other terms, physiologists have found that within 24 hours, 125 grammes of meat were sufficient for an adult, associated to 300 grammes of potatoes and 50 grammes of butter and cheese. The food which is taken in excess is not absorbed ; it then undergoes chemical changes in the alimentary canal and at last putrifies ; and quantities of gas such as carbon-dioxide, carburetted hydrogen and hydrogen sulphide are formed, as I said before, in explaining the fermentation produced during the digestive process. It is then, especially, that dyspepsia arises and that constipation and irritation, causing diarrhoea which does not always empty the bowels, are produced. Some of the putrid substances are absorbed, and then appear signs of evident poverty of the blood, a febrile condition, torpor and heaviness, fetor of the breath and sometimes, possibly, even jaundice.

When excess of albuminates continually passes into the system, if especially a certain amount of exercise is not taken at the same time, there is a want of proportion between the absorbed oxygen and the absorbed albuminoids which lead to imperfect oxidation. Nitrogenous substances, instead of being converted into soluble urea, remain in the state of insoluble uric acid ; gouty affections have no other origin. Should excess of starchy food be taken, an excess of fat is produced which accumulates in the tissues, leading to obesity with all its inconveniences.

In conclusion, what can we say of Tolstoi's third proposition, that animal alimentation should be replaced by vegetable diet ? You know that there exists a certain class of individuals who contend with Tolstoi that animal alimentation is absolutely useless; they are called vegetarians

Here, we must make a distinction. It is evident that animal food is not absolutely necessary. Herbivores are beings like us, having the same physiological laws of nutrition, heat and respiration and still they do not starve although they consume no meat whatever. The Hindoos, Arabians, Chinese and others are satisfied with rice, dates, flour, vegetables, and fruits. If, to these aliments they join milk, eggs, butter and cheese they then possess a perfectly sufficient alimentation.

Chemists and physiologists agree in saying that in bread, peas and beans, there is enough azote to supply nutrition of the body. Cheese of all others is the alimentary substance which under the smallest volume contains the greatest quantity of nitrogen. Therefore the question is decided; we can live and live comfortably without eating meat. But this proposition by no means involves the consequence that animal alimentation must be given up. It is understood, and accepted that a certain quantity of nitrogen is necessary to the repair of our tissues. Milk, cheese, eggs, flour, fruits and vegetables can fully supply this quantity of nitrogen, but that alimentation has the inconvenience of requiring a large alimentary mass and consequently necessitates a more laborious digestive work than if a small quantity of meat were added to it. 100 grammes of bread contain about 1 gramme of azote, whereas 100 grammes of meat contain 3 grammes of it. Therefore as far as the nutrition in nitrogen is concerned, three times more bread than meat would be required to meet the wants of the organism. Besides, in supplying our system with the necessary quantity of azote, by the means of feculents and vegetables alone, we would be compelled to introduce into the stomach a disproportionate quantity of starchy food, with all the dangers of an excess of this kind of alimentation. In short, no one group of aliments is capable of alone properly sustaining healthy life and a combination of all, or nearly all the different constituents of diet is required to accomplish the best results.

It remains to me, now, but to thank you for your kind attention. I fear that I have perhaps abused your good will by the length of my paper. The only excuse I have to offer is that I had unfortunately no time to make it shorter. As it is, all my ambition has been to interest you. If I have succeeded I declare myself happy and satisfied.

Next Excursion to Pagan Falls.

September, 1893.

THE  
OTTAWA NATURALIST.

VOLUME VII. No. 6.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued September 1st, 1893.

Published Monthly at \$1.00 per annum.

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# NARRATIVE OF A JOURNEY IN 1890, FROM GREAT SLAVE LAKE TO BEECHY LAKE, ON THE GREAT FISH RIVER.

From the Journal of Mr. James McKinley, officer in charge at Fort Resolution, H. B. Co.

By D. B. DOWLING, B.A. SC.

The "Barren Ground of Northern Canada," is the title of a book recently issued by Mr. Warburton Pike. It contains a popular description of his experience of travelling and hunting in the country north of Great Slave Lake, and on the Peace River. A few notes from the diary of his sometime fellow traveller, Mr. James McKinley, may be of interest, as supplementing in a somewhat more detailed way the description there given of the country between Fort Resolution, on the Great Slave Lake, and Beechy Lake, on the Great Fish River. A part of their route was through the hitherto unexplored region immediately north of the Great Slave Lake,—a very rugged tract, dotted with lakes, followed further north by a more even though somewhat hilly country, almost barren, extending to Aylmer Lake.

Of previous explorations in the region to the north-eastward of Slave Lake brief mention will be made.

The earliest we find was that of Samuel Hearne, commissioned by the Hudson Bay Company to undertake an overland expedition, to make explorations to the north west of the inland sea on which they had their posts, and also to search for a large river, on which a copper mine was said to exist. Leaving Prince of Wales Fort, on the Churchill, he made two unsuccessful attempts to reach this river and copper mine, but in the fall of 1770 he again started, and by the middle of July, 1771, had reached the Coppermine River. The map of his route, with the latitudes of points of interest, are inaccurate and untrustworthy, but it is quite certain that in the spring of 1771 he passed near, if not over, Artillery and Clinton Golden Lakes. Returning in the fall of the same season, he arrived at some point on the north shore of Great Slave Lake, and crossed through a chain of islands to the south shore, where he arrived about the beginning of 1772.

Other expeditions, including Franklin's two, have since passed by the more western route. These seem to have passed to the west of the district under consideration.

Owing to the long absence of Capt. John Ross of the Victory, in the northern seas, a relief and exploring expedition was organized under the command of Capt. Back, who intended reaching the north coast of America by descending the Great Fish River. This was supposed to flow in a north east direction, and reach the sea at no great distance from the longitude in which Parry's ship, "Fury," had been abandoned in 1824. It was known that Ross would endeavour to reach this spot and take some of the store of provisions piled up on the beach. Capt. Back, therefore, in 1833 reached Slave Lake, and advanced by Artillery and Clinton Golden Lakes to Aylmer Lake, and made an examination of the head waters of the Fish River. He then returned to the wooded country to winter. At the eastern end of Slave Lake he built his winter quarters, and called the house Fort Reliance.

On March 26th intelligence reached him of the return of Ross, so that the expedition now was for exploration only.

Early in the spring a start was made, and during the summer he successfully descended the river to the sea, and by fall had returned to his former winter quarters, where he passed the winter of 1834-5, and then returned to England.

One result of the explorations of Dr. Ross on the shores of the Gulf of Boothia in 1853-4, was the obtaining of relics of the Franklin expedition from the Esquimaux, with the information that some at least of the party had reached the mainland, near the mouth of the Fish River, though they probably all perished in that vicinity. England at that time was engaged in the war in the Crimea, and could not at once fit out a relief expedition, but asked the Hudson Bay Co. to undertake and fit out an expedition to descend the Fish River, and search the coast in the vicinity of its mouth. This expedition was under the direction of Messrs. Anderson and Stuart, officers of the Company, who, in 1855, made the descent of the river, but were only partly successful in finding traces of the party, and returned to Fort Resolution the same season.

The next traveller giving any account of this district is Mr. Pike, as already noticed above.

During the season of 1889 Mr. Pike made a very interesting trip northward, to a large lake lying to the westward of Aylmer Lake, to

which he gave the name "McKay Lake," in honour of Dr. McKay, the Factor in charge of the Hudson Bay Co's posts in the Athabasca District. In this vicinity he spent some of the winter months, hunting the Barren-ground Caribou and Musk-ox ere he returned to Slave Lake. It was his intention to go much further north the ensuing summer *via* the Great Fish River. With a view to encourage trade with the Esquimaux who hunted in that district, Mr. Jas. McKinley, the clerk in charge of Fort Resolution, joined with Mr. Pike in forming a somewhat large party. The proposed route was evidently to retrace Mr. Pike's steps northward to McKay Lake, thence coasting eastward to the outlet, and following the Lockhart River to Aylmer Lake, from the north east corner portaging to the Great Fish River, but after reaching Lac du Mort on this route, a short distance north of Slave Lake, the direction was changed to a more direct course, across country to the Lockhart River.

On the afternoon of May 7th, with dog trains and sleds or toboggans, the party left the Hudson Bay Co's establishment at Fort Resolution, and travelled principally on the ice of the lake northward along the eastern shore. On the 9th they crossed the lake to the group of islands called by Capt. Back, Simpson's Group. Turning more to the north east, their course for several days lay among the islands forming this chain, and on the 13th they probably reached the narrows, or within a short distance of that point. Here they met some Indians, and halted to engage them to accompany the party. Much objection was made owing to the scarcity of provisions, the Indians being in a starving condition and the travellers but lightly equipped. This necessitated a delay to hunt, and finally on the 23rd they all started and travelled about ten miles. On the 23rd the travelling was slow, and they went probably the same distance. Of that part of the lake the description given in the journal is as follows: "The lake on leaving camp widens out, is studded with rocky islands, and the banks on each side are high and rocky, sparsely covered with stunted pine and birch." The next day they travelled only about five miles on the lake to a small river, up which they turned, leaving the Great Slave Lake. "We found on following up the little stream a succession of falls, which were all frozen, with high banks of ice. These took us till evening to surmount, some

of the men packing and the rest helping the dogs. Climbed to the top of the hill and found a high, rolling, rocky country ; hardly any trees to be seen."

"May 25th.—Made a portage for four miles to a long, narrow lake. Then more rocky portages and small lakes till mid-day, when on account of the thaw we halted near a high cliff at a small, round lake. Started towards evening, and made a short portage into Lost Dog Lake. Made a couple of miles on this lake, and left by a low valley and camped in sight of Lac du Mort. Rocky ridges all around, here and there thinly strewn with small pines. If it were not for the lakes, which cut up the country, it would be impassable. They are generally more like a river than a lake. The portages are short, and continue to get lower the further we get away from the range of hills which skirts the north east shore of Slave Lake. The track is fairly straight. West of north is the general course.

"May 26th.—By mid-day reached the north end of Lac du Mort, where we were obliged to camp. Made about eight miles. This lake is rather large, with long bays surrounded by smooth, rocky hills or banks nearly destitute of timber. This gives it much the appearance of a lake in the rolling prairie.

"May 27th.—The party remained in same camp, hunting in the vicinity with apparently little success. Of the country seen, he says it consists of "long ridges of either smooth rock or piles of loose stones, similar to the edge of the lake, between which are mossy valleys or narrow lakes."

"May 28th.—Travelled to the end of Lac du Mort and portaged to the next lake." Here they thought they had found a *câche* of meat, and spent a couple of days trying to thaw it out, but it proved a disappointment, and they halted still longer, hunting the country over to find the deer. They travelled now only short distances—a mile or two—towards reported bands of deer. Of the country he says : "We have now got past the last of the belt of hills which lie to the north of Lac du Mort. The country, looking ahead north, is a level or rather rolling field of snow as far as the eye can see. The snow is perceptibly deeper as we go north." "In the immediate vicinity the rocky ridges are often

covered with loose boulders, while between, lakes occupy the low ground ; a fine grass thinly shows amongst the moss, rather like bunch grass ; wood now and then in sheltered places." On the 3rd June they succeeded in getting among the caribou, and the journey was resumed.

" June 3rd.—Made a small portage to Bear Head Lake. Travelled in the night on account of the heavy thaw. Camped about midnight.

" June 4th.—Were obliged to pass the day in the same place on account of the heavy thaw. Since the caribou are apparently in more numbers to the east of the track we have been following, the Indians have decided to break off and cross to Capt. Blanc's route or Stewart and Anderson's track. The endless chain of lakes which intersect the barren, stony ridges, enables one to take any direction.

" June 5th.—Shifted camp across the lake to get wood, having burnt up all around this camp. Snow drifting like mid-winter. Found a fine clump of pines in which to camp. The lake is about two miles and a half wide at this point.

" June 6th.—Shifted camp a couple of miles to the end of Bear Head Lake. This is a lake I should say of about 10 or 12 miles in length, and of about two miles in width. Surrounding country still of rolling, broken ridges. The party remained in same camp till June 9th. Some further notes of the surrounding country observed on their hunting excursions are added. The country still the same as that to the west. Rolling ridges, broken rocks and loose stones, often of immense size balanced on a few smaller ones, are a very common feature. The ground is covered with several kinds of mosses, and a small plant bearing a small black berry. Cranberries are also to be found in the swamps, where there is also a short grass with a thin, round blade. Wood is getting scarce, and only to be found in sheltered spots.

" June 9th.—Off this morning and made probably 8 miles. Course, N. E., to strike Capt. Blanc's track, first on two small lakes and then on a long one, in appearance like a river, at the end of this we camped. After dinner we all started off hunting. The country still of the same appearance, but not a single stick of wood did I see. Noticed mica in small quantities, of a poor quality. The rocks are of small sizes, being split up by the frost and other causes.

"June 10th.—Heavy thaw, with water on the ice of the lakes. Made about 4 miles on small lakes, with short portages between. Wood is very scarce at this camp, and we can only find a few dry roots on spots where the snow is off the ground. The same bleak country. Red and gray granite rocks and ledges everywhere.

"June 11th.—Travelled about five miles in an easterly direction, on a long, narrow, winding lake. The hills are a good deal higher to-day, with rougher abrupt bluffs and broken rocks. Leaving the lake we made a small portage, and camped below a bank of fine sand of a red colour, on the edge of another lake at the end of the little rocks. This is on Stewart and Anderson's route, where they canoed it to the Great Fish River. The bank of sand on which we are now camped extends for a couple of miles, and is perhaps half a mile in width. It is quite a pleasant sight after the monotonous rocks. It is formed into ridges, mounds and hollows like its rocky neighborhood, and bears a few small stunted pines here and there."

Owing to the thaw the water from the melting snow had so accumulated on the lakes, that the party were obliged to wait until the ice and snow had so loosened as to rise above this. The snowshoes were no longer needed, and consequently had been abandoned. Four days were lost on this account, and on June 15th a start was made again, but the travelling was very bad, only about 5 miles being the progress for the day. The lake, from their account, would be about 15 miles in length, with many rocky islands and points. Good whitefish reported in it, though the party did not set any nets.

June 17th.—"Started in the morning and travelled 8 or 9 miles to the north eastern end of the lake, and made a portage of about a mile, camping half way on it on account of the scarcity of wood. Here there are only bushes of stunted pines; the largest is not a yard in height. They are of a considerable size at the base, from which the branches spring; the whole is bent and crooked in every imaginable position, and generally dry at the top.

June 18.—Finished the portage, and travelled on a narrow lake about 5 miles, to where a little river joins it with the next lake in our route. The ice in it we found had gone, so we had to make a portage of about a mile and a half over the hills.

"The whole of this section of the country is simply a bed of stones; no gravel or earth of any kind, but the stones piled on each other with great holes between. The country much the same in appearance, only less large bluffs of rock, and now and again large areas covered with loose stones. No bushes, except on the borders of lakes, and occasionally small patches of grass in the hollows.

"June 19th.—Left the men packing down to the lake and started ahead to see some clumps of large pines. The bay we first reach is a long inlet, running north and south about six miles. At its northern end it widens out, forming a large, apparently circular lake of about ten miles in diameter. The narrows being three or four miles wide, we there took the western shore and passed over a pretty fair level country, having more soil and stretches of grass, and sandy hills and ridges, and several patches of pines suitable for building purposes and firewood. On the whole it is the best country seen since leaving Slave Lake. Parties who took the east shore of the bay report the country unusually smooth and level. All around the lake there is plenty of firewood. A small river runs out to the south from the north east end of the bay. Our party with the dog trains followed the east and south shores of the lake, and camped at the south east end, having made some sixteen or eighteen miles. Good travelling on the ice. Duration of sun light for the day, 20h., 40'.

June 20th.—Left camp about mid-day and made a portage to the east of about two and a half miles into a long, narrow lake, running northwards. Went about two miles on this lake, and camped on a dry point. The country north of this appears level as far as one can see, and less covered with boulders and rock than that we have left behind. Small bushes of pines in clumps in the low ground. The travelling on the ice is much improved, owing to the surface water having drained off.

June 21st.—Taking the right side of the lake we found the country much more level than we had seen it. It consists of long, smooth, sandy ridges, covered thinly with bunch grass, while in the muskegs and on the edges of the numerous small lakes much more grass is to be found, with small pine bushes in the sheltered spots. We must now be getting very near to the so called last woods."

The party camped early after travelling about ten miles, as they had succeeded in killing sufficient deer to keep them busy the rest of the day cutting up and drying, and also a sufficient supply to give them a quiet Sunday in camp.

"June 23rd.—While the men were fixing up the sled for a start we went ahead, crossing a point on the south east side, where we found a small stream entering the lake. Here the Indians were successful in catching several fine trout, which we roasted for dinner. The country we found rocky, and intersected with small lakes. The party with the dog sleds made about eight miles.

"June 24th.—Made about four miles to the end of the lake, which is probably about twenty miles in length, and from two to two and a half in breadth. Then portaged over a mile to the north east end of another small lake, which we crossed about three miles, and pitched our camp. Wood is getting very scarce. In winter the little that is here must be covered deep with snow.

"June 25th.—From here we have to make a portage of four miles to a small lake on the course of the Lockhart River, which connects McKay Lake and Aylmer Lake. Found the river open between the lakes, and lots of water at the lake edge. Went about two miles on the north east bay of this lake to the outlet—the Lockhart River—and camped on the north bank. The native soil of the Musk-ox. Here a portage has to be made of over a mile over a rocky hill. On the road we saw a couple of Musk-ox heads killed a couple of years ago by one of our men. The country near the mouth of the river is smooth and sandy, with a good deal of muskeg. On the north bank a range of hills runs north east, having the general aspect of rocky and rough land. Aylmer Lake, as seen from this point, bends away to the south east. The river that runs below this hill is probably about a mile in length from the intermediate small lake to Aylmer Lake.

"June 26th.—From here we sent several men up the river to McKay Lake to bring back a large birch canoe, used by Mr. Pike last year, the Indians taking our baggage on their sleds. Got on the rocky portage and had dinner, and then started off on Aylmer Lake, but found

*To be Continued.*

## EXCURSION No. 3.

Taking advantage of the kind invitation of Mr. and Mrs William Borthwick, which had been standing for some time, the Club made its third excursion for the present season, on Saturday, 8th July, to Borthwick's Springs, in the Township of Gloucester, some seven miles east of Ottawa. Mr. Borthwick has entered upon the production of fruit as well as the sale of it, and large plantations of small fruits have been made, with promise of great success. About thirty members attended. The trip was made in vans, starting from the Post Office at 2 p.m., and in spite of a violent thunderstorm which overtook them on the way, all reached the objective point without mishap shortly before four. Here they were hospitably received by Mr. and Mrs. Borthwick, and the weather soon clearing the party proceeded to inspect the spring. This lies in a marshy tract at the foot of the hill on which the house stands, and close to one of the branches of Green's Creek. A building has been placed over the spring, with appliances for barrelling and shipping the water, which is sold largely in and about Ottawa. It is of a rather pleasant saline taste, and is celebrated for its mildly aperient properties. An analysis made several years ago by Dr. J. Baker Edwards, of Montreal, is given below. The well known peat-bog, the *Mer Bleue*, commences a short distance farther to the east, and it had been intended to pay it a visit, but owing to the condition of the ground after the storm this had to be omitted. After a generous lunch, provided by the hostess, the Vice-President, Mr. F. T. Shutt, took the chair, and devoted a few opening remarks to the subject of mineral springs, their geological origin and chemical constituents. He then introduced Messrs. R. B. Whyte and John Craig, who delivered addresses upon the botanical specimens collected during the afternoon. Mr. Whyte drew attention to a number of beautiful flowers of easy cultivation, such as the Cone flowers (*Rudbeckia*) and native orchids, characteristic of that district, which should be found in every garden. The apt and striking way in which the distinguishing points between different species were described gave Mr. Whyte's lecture additional interest.

An addition was made to the local list of plants, in the shape of *Ranunculus sceleratus*, found by Mr. J. F. Whiteaves.

Mr. Craig spoke of the economic value of some of the grasses found in the vicinity, emphasizing the value of June grass for lawns, and the necessity of making a continual warfare on quack grass.

A vote of thanks to the host and hostess was moved by Capt. McElhinney, and gracefully acknowledged by Mr. Borthwick. The return journey was then undertaken and Ottawa was reached about sundown. A. G. K.

#### ANALYSIS OF THE WATER BY DR EDWARDS.

The specific gravity is 1.008. It is not aerated, nor is it alkaline. It contains (in 1000 parts) of saline and earthy chlorides, 11.9 grains, and of bromides and iodides, 0.4 grains. It contains, like some of its congeners, a small portion of strontium, and both bromide and iodide of magnesium. Of total solid saline matter, it contains per Imperial gallon of 70,000 grains, which I estimate to be combined as follows :

Chlorides, 833 grains per gallon, combined as

Chloride of Sodium .....	784.70
Chloride of Potassium .....	10.50
Chloride of Strontium .....	1.40
Chloride of Calcium .....	14.70
Chloride of Magnesium .....	21.70
Bromide and Iodide of Magnesium .....	2.80
Sulphate of Strontium .....	2.10
Sulphate of Calcium .....	15.40
Sulphate of Magnesium .....	19.60
Silica and Oxide of Iron, etc. ....	4.90

Saline contents of one Imperial Gallon ..... 877.80

#### CHEMICAL ANALYSIS OF MANITOBA SOIL.

##### THE CAUSE OF ITS GREAT FERTILITY EXPLAINED.

In the American Chemical Journal, Vol. XIV, No. 8, is a particularly interesting article by Mr. F. P. Dunnington, in which comparative analyses by Mr. T. C. Whitlock are given of examples of (1) Soil, furnished by Dr. George M. Dawson, F.R.S., etc., from the prairie lands of Red River, taken at Rosser, about 15 miles west of Winnipeg, and (2) Tschernozem or Black Earth of Russia, from the district of Balashoff, in the government of Saratoff. The specimens are described as so similar in appearance that they cannot be distinguished by the eye.

## ANALYSIS.

	Manitoba.	Russia.
Sand	59.82	53.71
Silica, amorphous	5.45	12.80
Ferric oxide	4.00	4.13
Alumina	7.14	6.04
Titanic oxide	.64	.63
Lime	.61	.75
Magnesia	.61	.21
Sulphuric oxide	.03	.06
Carbonic oxide	.37	.02
Phosphoric oxide	.13	.16
Potash (with trace of Soda)	1.91	1.97
Organic matter	12.49	14.91
Containing humus (soluble in ammonia)	(.45)	(.44)
“ total nitrogen	(.44)	(.31)
Water	6.86	5.04
	99.76	100.43

“With the exception of the amounts of carbonic acid, and of the proportion of the silica which is amorphous, the composition of these two specimens is almost identical.

“The peculiarly large amounts of organic matter and nitrogen, as well as of the principal constituents of the ash of plants, lime, potash and phosphoric acid, are all to be noted and accord with the well known exceeding fertility of each of these soils.

“The soil from Manitoba is described by Dr. Dawson as spread with great uniformity over the Red River Valley, a wide prairie on the first or lowest prairie level of the north western country. It has a depth of say one to four feet, and consists of the superficially modified parts of the sediments of a later glacial or post-glacial lake, which at greater depths are found in the form of well bedded silts. . . . . The surface is a dark mould, composed of the same material as the subsoil, but mingled with much vegetable matter. . . . . The uniform fertility of this soil cannot be exaggerated.

“The Tschernozem or Black Earth of Russia has long been famous by reason of the heavy crops which it has, in many localities, annually produced for almost a century. Prof. Krassnof, in a paper (Proc. Geol. S. Amer. 1891, p. 68,) describes it as distributed over the steppes of the

south eastern portion of European Russia. He concludes that this black colour is due to an accumulation of vegetable matter from the herbaceous plants of the poorly drained steppes of the post-glacial deposits which overlie the loessoid clays, so difficultly permeable to water. At the close of this paper he draws attention to the close correspondence which exists between the climate of Russia and that of the prairie land of Minnesota, and suggests the probable similarity of the soils of these regions.

"The above analyses make it to appear that the Tschernozem and the soil of the Red River prairies are similar in chemical composition; they occur in the same latitude, with the same general relief and climate, and from the above quoted authorities are judged to have a similar geological history; may they not, therefore, be properly considered as of the one variety of soil, "Black Earth."

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#### BOOK NOTICES.

SCUDDER, S. H. A Brief Guide to the Commoner Butterflies of the United States and Canada. 12mo., 12 + 206 pp. Henry Holt & Co., New York.

In our August, 1892, number we gave notice of a Butterfly book for boys which Mr. Scudder had in preparation. We took occasion then to point out the advantage of all young people having some hobby in natural history, and looked forward with pleasure to the early appearance of this work, which should, we thought, act as a first stepping stone from which young students might find an easy entry to one of the most attractive fields of study offered to us by Mother Nature. Such a book, which was much wanted, has now been prepared by Mr. Scudder in his characteristic manner, and has been published by Messrs. H. Holt & Co. as a neat duodecimo of convenient form, well printed and got up. This little work treats only of the commonest butterflies, such, in fact, as any energetic collector in the Northern States or Canada is pretty sure to take within a year or two. It is to be followed by a more complete Manual of the Butterflies of North America, north of Mexico, to be issued at an early date, and prepared in a similar style to Gray's Manual of the plants of the Northern States. Mr. Scudder's Brief

Guide will, we believe, be the means of inducing many to take up the study of butterflies, who have been prevented from doing so for want of a suitable and accurate book. The introductory chapters, treating generally of the nature, structure and habits of butterflies are very concise, covering the ground well, and with the concluding chapters where instructions are given for the collection, preservation and rearing of insects, provide the beginner with all that is necessary to make him a good naturalist. J. F.

SCUDDER, S. H. *The Life of a Butterfly.* 12mo. pp. 186, 4 plates.

Under the above title Mr. Scudder has written in untechnical language a charming little book, in which while recounting the life-history of the Milk-weed Butterfly, he compares it with other species and succeeds in condensing into a remarkably small space an account of the most interesting features in the lives of the whole tribe of butterflies. It has been prepared for the general reader, and the hope is expressed that it "may perhaps gain for butterflies the serious study of some who had before looked at them as merely pretty creatures,—types of the frivolous,"—we feel sure that it will do this and much more besides. We recommend it heartily to all boys and girls of healthy mind, to naturalists and to thoughtful readers. J. F.

## ENTOMOLOGY.

Edited by J. FLETCHER.

*Hypomolyx pineti* Fabr. This large pine-weevil has not been previously recorded from our district, but a dead specimen, in good condition, was found at Casselman (June 10th) in the leaf of a pitcher-plant. Among the contents of leaves examined *Cytilus sericeus* appeared very frequently. A small, pale crustacean was also not uncommon, and seemed to thrive in its prison cell. W. H. H.

*Adimonia rufosanguinea* Say. At the Mer Bleue this pretty little Chrysomelid was very abundant upon *Kalmia augustifolia*, and occurred also occasionally on other plants. Hitherto I had generally taken this species upon the wild cherry. W. H. H.

*Aphodius prodromus* Brahm. This European beetle appears to be extending its range westward. Dr. Horn, in his monograph of the sub-family (1887,) recorded it from Maine and Montreal. Several

years ago I received a specimen from my brother in Campbellton, N.B., and soon after specimens from the late Mr. Caulfield, of Montreal. This year Mr. Fletcher took several at the Experimental Farm at the end of May, and I captured one at Eastman's Springs. W. H. H.

*Desmocerus palliatus* Forst. On June 14th I took a pair of these beautiful longicorns upon an Elder bush, and on the 26th received one from Col. Chamberlin, which he had taken in his garden in New Edinburgh. The larva lives in the stems of the Elder, and the beetles, though not common, can usually be found by a careful examination of the shrubs in June. It is perhaps the handsomest of our Cerambycidae, especially when alive and in the sun light. It is almost an inch long, of a deep steel-blue colour, and with a bright yellow band across the base of the elytra, from which it derives its name of the Cloaked Desmocerus. W. H. H.

*Ditylus cæruleus* Rand. While at Casselman (June 10th) two fine examples of this usually rare beetle were taken, almost accidentally. The first crawled up on a log where we were collecting *Tritoma humeralis* in fungi, and the second came crawling up to us as we were lunching. This beetle seems to inhabit swampy areas, as last June we captured specimens in a beaver-meadow at Sudbury, and another was taken about the same time at the St. Louis Dam by Mr. J. A. Guignard. The western species of this genus seem to be more abundant, as numerous specimens have been received from British Columbia. W. H. H.

*Ergates spiculatus* Lec. A fine female of this beetle has been received from Rev. Father Dontenwill, O.M.I., now principal of St. Louis College, New Westminster, B.C., who a few years ago was a frequent attendant at our Monday afternoon lectures. *E. spiculatus* is the largest beetle found in Canada, and belongs to the Longicorns or wood-borers. The present specimen measures  $2\frac{3}{8}$  inches from the front of the head to the end of the body, and  $\frac{5}{8}$  inch across the base of wing cases. J. F.

*Argynnis Triclaris* Hüb, in the Ottawa District. I was much surprised and pleased at taking a few specimens of this rare butterfly in the *Mer Bleue*, on 13th and 14th June. It is a northern species found in Labrador, at Hudson Bay and in the Rocky Mountains. The size and general appearance when on the wing are similar to *A. Myrina*, but the

flight is stronger. It was no easy matter to run them down over the soft sphagnum swamp as they dodged amongst the stunted spruces, with the thermometer ranging between 80 and 90 degrees. J. F.

*Diplax costifera* Uhl. Two specimens of this rare dragonfly have been taken this summer by Master Stephen MacLaughlin, in Powell's Grove. One specimen was taken here some years ago by Mr. T. J. MacLaughlin, but the exact locality was not then noted.

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## BOTANY.

Edited by W. SCOTT, B.A.

*Aphyllon uniflorum* at London, Ont. Some fine specimens of this interesting Orobanch were found on June 2nd in Mount Pleasant Cemetery, near London, Ont. They were growing in the grass, the large purple corollas having a very attractive appearance. This is the first record of the plant being found near London. Some more specimens were found in the woods on June 10th. The same plant has been collected also by Mr. J. Dearness, of London, in the Township of MacGillivray, Ont. J. ALSTON MOFFAT, *London, Ont.*

*The Mayflower.* Some beautiful specimens of *Epigaea repens* have been received from Fort Coulonge by Miss McKellar, of the Richmond Road. Members of the Club will always hear with interest and satisfaction of new localities in our district for this floral treasure of the spring. R. H. COWLEY.

*Erythræa Centaurium*, Pers. (Centaury.) I found this elegant little member of the Gentian family growing in some numbers among grasses and flowering at the end of August at Roach's Point, Lake Simcoe. Gray's Manual (revised edition) gives as localities, "Waste ground, shores of Lakes Ontario and Michigan." The only Canadian record mentioned in Macoun's Catalogue is "Sandy wastes on Sable Island, off the coast of Nova Scotia. Collected July, 1870, (*Mrs. Almon.*)" I therefore thought that this note might be of interest to the readers of the Naturalist. C. J. S. BETHUNE, *Port Hope, Ont.*

## GEOLOGY.

EDITED BY H. M. AMI, LL. D., F.G.S.A., ETC.

*On a small collection of Fossils from the Trenton Limestones of Port Hope*.—Port Hope is situated on the north shore of Lake Ontario, near the mouth of Jones's Creek, a stream which is slowly cutting for itself a bed in the hard Trenton limestone. In former ages it was a stream of much greater dimensions, and evidences of raised beaches are seen along both sides of its valley. The higher ground is here occupied by clays, mostly glacial, and sub-aerial denudation has played a prominent part in making for the town its peculiar orographic site above the present level of the lake.

On the occasion of my last visit I saw an outcrop of limestone, at the Rapids near the Bridge and foot of the main business street, from which a number of fossils were obtained, or noted. They were all typical or rather common Trenton forms, and are here recorded only because I have so far seen no list of fossil remains from this locality. The species are as follows:—

1. Crinoidal fragments. 2. *Heterocrinus simplex* v. *Canadensis*, Billings. 3. *Stictopora acuta*, Hall. 4. *Prasopora Selwyni*, Nicholson, (= *P. lycoperdon*, Rones.) 5. ? *Diplotrypa Whitcavesi*, Nicholson. 6. *Lingula* sp. 7. *Orthis testudinaria*, Dalman. 8. *Leptæna sericea*, Sowerby. 9. *Strophomena alternata*, Conrad. 10. *Anazyga recurvirostra*, Hall. 11. *Vanuxemia Montrealensis*, Billings. 12. *Modiolopsis* sp. indt. 13. *Trochonema umbilicatum*, Hall. 14. *Orthoceras* sp. 15. *Dalmanites callicephalus*, Green. 16. *Asaphus platycephalus*, Stokes. 17. *A. Canadensis*, Chapman. 18. *Calymene senaria*, Conrad.

It would thus appear that the light grey, somewhat bituminous and impure limestones of Port Hope belong to the Trenton and well up in that formation. With time to collect along Jones's Creek, a careful observer should obtain much interesting material. H. M. A.

## THE NEXT EXCURSION

Will probably be to Pagan Falls, on the Gatineau Valley Railway. Arrangements are being made for as early a date in September as possible.

October, 1893.

THE  
OTTAWA NATURALIST.

VOLUME VII. No. 7.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:  
PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued October 5th, 1893.

Published Monthly at \$1.00 per annum.

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# NARRATIVE OF A JOURNEY IN 1890, FROM GREAT SLAVE LAKE TO BEACHY LAKE, ON THE GREAT FISH RIVER.

From the Journal of Mr. James McKinley, officer in charge at Fort Resolution, H. B. Co.

By D. B. DOWLING, B.A. Sc.

*(Continued from page 92.)*

the walking on the ice very bad. Collected all the small drift willows at the points passed, as there is no wood here. Made about five or six miles and camped on a low point a short distance from a small river that falls in on this side the lake. The banks of this lake appear to be low and covered with grass, gradually rising as they recede from the lake. The Indians are now nearly all carrying canoes on their sleds, picked up here and there, where they had been cached on the route.

"June 27th.—Followed the north shore of the lake, and found it nearly level and good walking, but had to take the ice to avoid streams which were open. The north shore continued level, but we crossed a deep bay where the hills came to the lake again. Here we camped on a small island after travelling about eight miles. Willows, etc., for fire-wood, have to be carried on our sleds from wherever they can be picked up.

"June 28th.—Started off again in a north east direction, making about eight miles. We have kept the north side of the lake all along. It is indented by many long bays, and dotted with islands. A greater portion of the hill sides are grassy slopes, and the level plateaus covered with moss and grass, with here and there ridges of rocks and stones. There seems quite enough feed for horses and cattle in summer, but there is not a sign of anything in the shape of bushes large enough to make a fire. Moss is the only thing in this region that will burn. The canoe route to Slave Lake stretches away to the south east, through an arm of this lake, then through several other lakes connected by the Lockhart River, to the eastern end of Slave Lake. From the western extremity of McKay Lake to the eastern end of this lake is about one hundred and fifty miles, general course, east and west, all of good navigable water. The route to Fish River from here is north east to the end of the bay running in that direction, then a portage of some length to the headwaters of that river.

July 1st.—Started late on account of fog, but made the end of this day, called Sandy Bay, which we have been following, and camped on a high bank of sand. Close by to the north of us, a range of sandy hills and banks runs east and west, at the foot of which a small stream, one of the sources of the Great Fish River, runs. The country in sight and surrounding, consists of prairie ridges, with most of the hollows occupied by small lakes. We have finished our sled work, and as our large canoe is in good condition, we are prepared for a trip down the river, having plenty of ammunition and fishing gear. We will probably have a few days delay where we finally part with the indians, getting shoes made and meat dried to cache along our route, to insure our way back.

“July 2nd.—Remained in camp at Sandy Bay, repairing canoes, dressing leather &c.

“July 3rd.—The indians with their small canoes, portaged to the south west, crossing a narrow lake on the ice, and then turned northward, and camped when they reached the river. Our men passed down by the small river, but had much trouble getting through, breaking the canoe shortly after starting, as the river was very shallow and full of stones. Seven portages had to be made, and much time spent following the open waters on the margin of the larger ice covered lakes, so that it was about two o'clock when they joined the camp. The camp on Sandy Bay is probably not over four or five miles from us here, in a straight line to the southeast. Among the rocks on the river bank, there are enough dry sticks for firewood. No pines of any description are to be seen, nothing but willows; but they grow to a good size for this quarter. The country is a rolling prairie, with more moss and stones, but less grass than the prairies south. The banks and bed of the stream, are stoney, widening out here and there into narrow lakes, connected by the river which is there generally rapid.

“July 4th.—Portaged the canoe over a bad part of the river, to a lake, around the edge of which there is a narrow passage. Striking inland, I crossed a couple of small streams falling into this river, and saw a large lake to the west. The country is grass covered ridges, with here and there, mostly on the margins of small lakes, piles of rocks. The course of the river to-day, is about due north, on which we have

made only about five miles, camping at the mouth of a small branch entering this lake expansion, which is called Musk Ox Lake.

"July 5th.—Started off again this morning, but made poor headway, as the canoe has to follow the shore line, where there is only a small passage free from ice. We made probably four or five miles on Musk Ox Lake, which lies nearly north and south, and is from a mile to a mile and a half in breadth. This shore of the lake is pretty much the same as that seen yesterday, being bordered by grassy hills and valleys, but from here north is yet more hilly and rocky. The eastern shore appears rough and rocky."

Near the northern end of this lake, there appears to be a favorite crossing for deer, that being possibly a narrower pass, and as there is an island there the deer in swimming has a resting place in the middle of the swim. Here the indians expected to make a big hunt, or to slaughter great numbers in the water, and thus make a supply of dry meat for the trip onward. From the hides they make their shoes, and often other articles of wearing apparel. Consequently the party halted here, moving their camp the next evening a few miles further north, to a commanding position overlooking the probable place of slaughter. A party consisting of a few hunters had been despatched a few days previously to this place, but very few deer had been seen and consequently the hunt was not very satisfactory. This necessitated a much longer delay than was expected, and any game that could be had was taken. Generally the Musk Ox is not relished as an article of diet, but they were compelled to shoot numbers of these animals to supply the larder. Of this lake and vicinity the Journal says:—

"To the east of our camp across the lake, are the Musk Ox mountains, more properly hills. Northward the country appears to get wild and rocky again. At a distance of three or four miles, a ridge of hills runs north and south, at the foot of which is a river flowing from the westward out of a large lake to this river. The rocky ridge on which we are camped extends to the north west, and from a hill on it, a couple of miles out, can be seen the west branch of this river, of about the same size as the one we followed, flowing in a large valley, apparently a mile or two in breadth, sloping up

gradually to the hills by which it is bordered. A smaller stream flowing from some small lakes in sight, joins the river just below this place. A few remains of snow drifts still are to be seen here and there, but the country generally appears green and fresh."

Several very stormy days on which it snowed pretty steadily, kept them all in camp, after this they decided from the small hunt to move on, so that after a stay of eight or ten days, they were again going northward. The river leading from the lake was very shallow and nearly impassible, so a portage, two miles and a half in length, was made northward over rocky country, to a lake, apparently in the same chain. Camp was made on the shore of this lake, and on the morning of July 18th, they started in the canoe again.

"Found the lake to be of about two miles in length, just as the river leaves it there is a rapid, in the centre of which is a small island on which we made a portage. Onwards, we found the river the whole way, with the exception of three small rapids, two of which we ran, more of the nature of narrow lake expansions than a river. It has very little current, and is very deep, with a width averaging two hundred yards. We passed through two lakes beside the one on which we camped last night, of two or three miles in length. On both sides of the river the country is rough, being covered with hills and bluffs of grey rock and stones. The general course of the river is north east. After having made eighteen miles we camped at the point where the river leaves the third lake, on the western bank where there is a fine sandy beach with a grassy bank rising to a hill behind. This Mr. Pike and I climbed and from there we had a good view ahead. The country we found fine and smooth, again with grassy ridges and valleys.

"July 19th—Starting out, we found a strong current with small rapids widening out again, after about a mile, into a long narrow lake possibly ten miles in length. A river from the west was noticed shortly after leaving camp. The banks on both sides were rocky. Leaving this lake the river flows for three or four miles with strong current having three or four rapids all of which we ran, then we enter a small lake on which, on finding a fine sandy beach on the east shore, we camped. From the north end of the long lake the country is pretty level prairie

with sandy hills and plenty of grass. A little before we reached the lake another stream enters from the west.

"July 20th.—Remained in same camp. From a hill back of camp saw a large lake still apparently covered with ice.

"July 21st.—Paddled to the end of the lake, about a mile. Here a ledge of rock runs across, to pass which we were obliged to portage everything, then we cross a small lake perhaps two miles long, entering the river again. It has here a small current but no real rapids. In a very short distance the river expands into a lake of a mile in length, then contracting into a narrow channel with a rapid. This we ran light, portaging the cargo. From the foot of this rapid the river widens out with a sluggish current for two miles, then a lake expansion for another two miles. To this point the morning's course has been nearly due north. From this lake we enter rough water, two miles being nearly all rapids. The upper half it was impossible to run so portaged but ran the lower half and entered a narrow winding lake, on which we made three or four miles and camped on a sandy ridge. A great deal of the country passed to-day consisted of benches and ridges probably grass covered, the banks of the river and lakes being high enough to conceal the view. Near the camp the banks of the lake become much lower being merely a long grassy slope to the sandy beach. There is very little wood in this part of the country and we have to use moss and green stuff for fire.

"July 22nd. —About four miles' paddling brought us to the end of the lake—direction about due north—then into the river again for about a mile, strong current but deep and good, we then cross a small lake of perhaps two miles in length. Here we turn to the east, the river flowing out of a bay at that end."

Here the party discovered an abandoned camp where the Esquimaux had spent some part of the previous season. After searching the place carefully, the indians determined the probable date of their departure and also the time of occupation, number of families and other details. Starting again the river was followed for nine or ten miles and found to be a large and deep stream, with strong current flowing through a fine prairie flat, with hills which appeared

smooth and grass covered, standing well back from the river. Then they entered a small lake on the north shore of which they pitched their camp under a rocky hill. Here there was fortunately a good supply of willow for fire wood. The prairie tract through which they had passed was sandy and dry, while near the rocks which they seem to have reached again more scrub willow is found growing in the sheltered corners where there is a little soil. The general course since leaving the Esquimaux abandoned camp "has been well to the east." The river leaves this lake at its north eastern end and is noted as consisting of alternate stretches of small lake expansions and narrow channel with strong current. There are two rapids but both were run. The series of lake and river stretches are estimated at ten miles. Beechy Lake is then entered upon and here on July 23rd the party had lunch after crossing over to the north shore. Before camping that evening they travelled eastward along the north shore of the lake about ten miles. Finding no further signs of the Esquimaux in this direction, they concluded they were on the wrong trail and decided to start again at the abandoned camp. This was done and they succeeded in finding the route by which the Esquimaux had come, viz. by a small stream from the west. They were then certain the Esquimaux were only to be found near Bathurst Inlet and as the party had not the time at their disposal to make the journey across country to the Inlet, they turned their faces homewards. The eastern route by Clinton Golden Lake, Artillery Lake and a small chain of lakes was taken to the western end of McLeods Bay, where the Companys' boat was waiting their arrival.

The first pine tree they saw on their way back was noticed on the river between Ptarmigan Lake and Artillery Lake and the first clump of pines about twenty miles down Artillery Lake. Of Artillery Lake Mr. McKinley has given a short description. "The lake lies nearly north and south, and at the northern end, in fact for most of its length, it is seven or eight miles wide. For about twenty miles the banks on both sides are prairie, but from that point the west shore is pretty thickly grown with pines of a fair size. The east bank throughout is prairie except here and there a few pines in a sheltered spot." The southern end of this lake was reached on the 13th of August and the Great Slave

lake on the 15th. The journey down the lake was made under more favorable circumstances than in the spring, they had now a large boat with a crew of indians, and waiting for favorable wind, they could make the run in about three or four days. They left the camp at the east end of McLeods Bay on the 19th, and camped on the evening of the 20th near the point of their departure from the lake in the spring.

#### ZOOLOGICAL NOTES.

##### BARREN GROUND CARIBOU, *Rangifer Grœnlandica*, Linn.—

On the present expedition the party lived almost exclusively by their guns, and as the most abundant, largest and best of the game animals was the caribou, the Journal is very exact in the account of the numbers seen and shot each day. This, of course, would vary in different localities.

This animal is essentially a rover, moving southward in the latter part of summer, wintering in the partly wooded districts and returning northward in the spring early before the ice is gone from the lakes. This season they had evidently started before the expedition, as none were seen along the north shore of Slave Lake nor on their trip inland until they were past Lac du Mort on June 1st. After this the party were not in the desperate straits recorded in the Journal up to that time. By following the bands of deer they were able to supply their larder whenever needed. Their dogs were better fed and stronger. The deer here seem to be all males and Mr. McKinley explains and states the fact as follows:—"They are the bucks on their way out after the does which have left some time ago to have their young near the sea coast. They (the bucks) move out as the snow disappears and meet them out on the barren ground on their return."

Their movement northward was at about the same rate as the travelling of the party of hunters. Occasionally these had to hurry up to get among the deer again. On July 12th, after a stay of ten days on Musk-ox Lake, they concluded the deer were nearly all north of them as they had been unsuccessful in killing many at a well-known crossing. On the 10th of June a note is made that the horns on the bucks were then a foot and a half in length and were much prized by the Indians as an article of diet.

The Musk-ox, *Ovibos moschatus*, Linn.—This is an animal that inhabits only the barren or treeless area of northern Canada. As will be seen from the Journal in regard to the appearance of the country passed over, the treeless area is not entirely barren, but in many places sustains bunches of a coarse grass and plenty of moss or lichen, which afford ample food for this great rush of caribou and the more sedate wanderings of the musk-ox.

The barren or treeless area was reached practically before they came to Lockhart River, but no mention of any signs of the musk-ox is made until they reach the small lake on the Lockhart River. Here on the north side were two skulls of animals killed two seasons before by a hunter who was present in the party. The north shore is called by Mr. McKinley "the native soil of the musk-ox."

The first one killed was seen on the north shore of Aylmer Lake. From there northward large numbers were seen as far as the expedition went. They do not wander in such great bands as the caribou, but feed in smaller herds around the hills, moving in search of food. The cows in the summer generally are more together, the bulls feeding apart or in couples.

Of the smaller mammals the following were noticed :—

WHITE FOX, *Vulpes lagopus*, Linn.—No mention is made of any of the party having seen these animals, but that they are to be found is evident from the many holes seen.

"June 30th —White or arctic fox holes we have come across now and then of late. The first we saw on the portage to the Lockhart River."

WOLVERINE, *Gulo luscus*, Sabine.—Mr. Pike shot three, August 2nd, and mention is made in several places of caches being robbed by these animals.

ARCTIC HARE, *Lepus timidus* Linn. var. *arcticus* Leach. The first signs of this animal were observed on Lac du Mort which is not a great distance north of Great Slave Lake. The note is to the following effect :—"Saw signs of the Arctic Hare on the banks of this lake, which is probably as far south as they come. They are now off out again to the open farther north."

The first one seen was near Bear Head Lake, June 3rd. Others were shot, one on June 6, one on June 11, and another June 30th on north side Aylmer Lake.

**PORCUPINE**, *Erethizon dorsatus*, Linn.—Are rather abundant in the northern timbered area. Mention is made of some being captured on the shores of Great Slave Lake early on the trip.

**MARMOT**, probably *Arctomys monax*, Gmel.—“ May 29th. Several ground hogs have been trapped. They are smaller than the mountain hog.” North end Lac du Mort.

Of the birds the most numerous was the willow Ptarmigan, *Lagopus albus*. They were numerous around Lac du Mort and were a very important item till the caribou were found. They were likely as numerous farther on but not as much sought for. On June 2nd, “ Their neck is now dark brown, the rest of their plumage white.” June 20th, “ The hen partridge is in summer plumage—speckled brown, but the cock is still white with brown neck.”

Geese and ducks were seen in several places and a general note to the effect that geese and ducks were flying north was made.

Swans were seen going north towards McKay Lake June 3. This may have been the whistling swan, *Cygnus columbianus*.

A small goose, called in the Journal a white wavier, was seen flying northward June 2nd and 8th and feeding in the ponds on June 11th. This may have been the Lesser Snow Goose, *Chen hyperboreus albatrus*.

A grey wavier was shot on June 9th, and on Aylmer Lake they were seen in large numbers. This probably was the American white fronted goose, *Anser albifrons gambeli*.

The smaller Ptarmigan were first seen on Lockhart River. These are the Rock Ptarmigan *Lagopus rupestris*. “ June 25th. The smaller kind, of which we have seen a few, I believe are more plentiful farther on. They are smaller than the white partridge. The cock bird is entirely white so far, but the hen bird is brown already.”

The Great Northern Diver *Colymbus torquatus*, was seen frequently, and one was shot on June 12th.

The Black Throated Diver *Colymbus arcticus* was shot by Mr. Pike on June 11th near Davids Lake.

## METEOROLOGICAL NOTES.

May 7th, Fort Resolution.—Water knee deep on the ice on Great Slave Lake and most of the snow gone.

May 8th, Great Slave Lake.—Wind north, froze hard enough to bear party on the ice.

May 9th, Great Slave Lake.—Cold, party crossed to Island.

May 20th, North shore Great Slave Lake.—Wind north, thawing in the sun.

May 22nd, North shore Great Slave Lake.—Wind north, very cold.

May 23rd, North shore Great Slave Lake.—Wind north, thawing slightly in middle of the day.

May 24th, North of Great Slave Lake.—Wind north, cloudy and thawing fast on the tops of the hills. The snow is mostly gone, except in the hollows.

May 25th, Among hills north of Lake.—Wind east, heavy thaw.

May 26th, Lac du Mort.—Wind north, thawing.

May 27th, North end Lac du Mort.—Wind north, thawing.

May 28th, Near north end Lac du Mort.—Very cold, north west wind with hard frost.

May 29th, Near north end Lac du Mort.—Very cold north wind.

May 30th, Near north end Lac du Mort.—Wind north and cold but calmed in evening.

May 31st, Near north end Lac du Mort.—Wind south and warm.

June 1st, Near north end Lac du Mort.—Fine day but wind turned north in evening. and cleared up with frost.

June 2nd, Near Bear Head Lake.—Thawing during day. Wind south west and fine.

June 4th, Bear Head Lake.—Fine bright morning, thawing after midday, a heavy storm of snow and sleet came from north west.

June 5th, Bear Head Lake.—Snowed a little all night and throughout the day. Snow drifting on lake like mid-winter, wind north west.

June 6th, Bear Head Lake.—Fine warm day, wind south.

June 7th, Bear Head Lake.—Snowing in the morning and continued to midday, wind northerly and chilly.

June 8th, Near Bear Head Lake.—Wind north but thawing slightly.

June 9th, North of Bear Head Lake.—Wind north east, thawing.

June 10th, Small Lakes north east of Bear Head Lake.—Wind north east but warm, water on all the lakes and the snow fast going.

June 11th, Blind Mans Lake (?)—Wind north east but a regular thaw, water running in all the hollows, and the snow in slush. Fog came up in evening.

June 12th, Sand Ridge.—Heavy fog in morning but cleared up about 9 a.m. Did not freeze much in night. Lakes forming in all the hollows.

June 13th, Sand Ridge.—Wind north east and raw, with now and again a few drops of rain. A slight fog towards evening arose but later on came very thick and storming. Most of the country is free from snow but large drifts still in the hollows.

June 14th, Sand Ridge.—Wind a little east of north, stormy and a very unpleasant day.

June 15th, Sand Ridge.—Wind north east. Rain, snow and sleet all day.

June 16th, Davids Lake.—Wind north east, storm continued to 10 a.m. then cleared up. Water and slush on portages.

June 17th, Davids Lake.—Wind north east, cloudy, milder.

June 18th.—Wind south, warm, a fine bright day.

June 19th.—Wind south and warm.

June 20th.—Wind north east but light and warm.

June 21st.—Wind north east, light and hot. Vegetation is pushing ahead rapidly, leaves starting on the small willows and flowering plants, in fact green grass showing with every sign of spring.

June 22nd.—Wind south and warm.

June 23rd.—Wind in morning, west and hot, but at midday heavy clouds came up with rain, wind veered round to north east.

June 24th.—Wind south.

June 25th, Lockharts River.—Wind south and fine. River open. Flowering plants are coming rapidly into bloom, and little or no snow to be seen.

June 26th, Lockhart's River.—Wind south and fine.

June 27th, Aylmer Lake.—Wind westerly, with a shower or two of rain. Turned colder towards night with frost.

June 28th, Aylmer Lake.—Ice on small pools in morning. Wind southerly and fine. The ice on the lake still good and sound, with snow in sheltered spots not melted from the edges yet. All the willows out in leaf and many flowers in bloom.

June 29th, Aylmer Lake.—Wind south west. The day started in with heavy rain and fog, but towards evening turned fine.

June 30th, Aylmer Lake.—Wind south west, fine and hot in the morning. Thunder storm about midday.

July 1st, Sandy Bay.—Wind north west strong and changeable. Fog in morning.

July 2nd, Portage to Fish River.—Wind north west, fine and warm.

July 3rd, Portage to Fish River.—Wind west; rained early in the morning but soon turned fine. The small lakes are now open but on the large ones there is only a small passage round the edge.

July 4th, Fish River.—Wind south and hot. Saw a loon's nest with eggs. All the other birds are about hatching.

July 5th, Musk-Ox Lake.—Wind southerly.

July 6th, Musk-Ox Lake.—Wind southerly and hot.

July 8th, Musk-Ox Lake.—Wind west and very hot all day, cloudy and close towards evening and lots of mosquitoes.

July 9th, Musk-Ox Lake.—Wind south-west and hot. A few remains of snow drifts here and there, but the country looking green and fresh.

July 10th.—Musk-Ox Lake.—Wind north-west, warm in morning and lots of mosquitoes. Later on thunder with light showers of rain after which it turned very cold and quite the appearance of snow.

July 11th, Musk-Ox Lake.—Strong north wind. Stormy with showers of hail all day. Wind increased in evening to a regular storm.

July 12th, Musk-Ox Lake.—Wind north-west; still stormy, snowed the whole of the day.

July 13th, Musk-Ox Lake.—Weather still unsettled.

July 14th, Musk-Ox Lake.—Wind west, cloudy.

July 15th, Musk-Ox Lake.—Wind west, clearing.

July 16th.—Wind west, cloudy with showers passing.

July 17th.—Wind south, fine.

July 18th.—Wind south-west ; a very fine day.

July 19th.—Wind south-west.

July 20th.—Wind south-west ; very hot.

July 21st.—Wind north-west.

July 22nd.—Wind north ; strong, heavy mist, hiding distant view.

July 23rd.—Wind westerly and light.

July 24th.—Rained most of night ; wind east with heavy rain all day.

July 25th, Beechy Lake.—Cloudy with showers of rain, wind north-east.

July 26th.—Wind east.

July 27th.—Wind north-east.

July 28th.—Wind north-east.

July 29th.—Wind south-east and very hot.

July 30th.—Wind south-east, rained 2 hours and during night.

July 31st.—Before mid-day began to rain and continued all night.

August 1st.—Wind north-east, rained heavily all day till near 6 p.m., wind north east.

August 2nd.—Wind south, fine day.

August 3rd, Musk-Ox Lake.—Rained at intervals through the night, wind south-west, blowing hard, showers passing all day.

August 4th, Musk Ox Lake.—Wind south-east, blowing very hard all day.

August 5th, South end Musk Ox-Lake.—Wind west.

August 6th, Portage.—Wind north-west.

August 7th, Aylmer Lake.—Wind south-west, fine day ; slight frost on grass and moss.

August 9th, Clinton Golden Lake.—Calm morning.

August 10th.—Wind west.

August 11th.—Wind north-west.

August 12th.—Wind northerly.

August 13th.—Wind south.

August 14th.—Wind south.

August 15th.—Wind north.

August 16th.—Wind light and southerly.

August 17th.—Calm.

August 18th, Great Slave Lake.—Wind south-west, rained heavily nearly all night and well into the day.

August 19th.—Wind north-west, but very light.

August 20th.—Wind west, but light.

August 21st.—Wind north.

### CONCHOLOGY.

Edited by F. R. LATCHFORD, B.A.

The presence in Ottawa of the Rev. G. W. Taylor, and his enthusiasm as a student of mollusca life, led the Conchological branch to organize an excursion to the Laurentian lakes on September 22nd. Behind a fine team of bays driven by Landreville, five enthusiastic naturalists left town, as dawn was breaking through a heavy downpour of rain. The vehicle was uncovered, but rubber coats and tarpaulins successfully repelled the attacks of Jupiter Pluvius. With tales of flood and field, of wild adventure on the Fraser, Columbia and Peace, and the prairies of Sumass and Manitoba, the time passed pleasantly and rapidly. The mountains were reached before nine, and to please the botanists present, an expedition was led to a defile, into which the Walking-leaf Fern *Camptosoros rhizophyllus* has retreated from the vandals who have exterminated it nearer Ottawa. A few specimens showing the tip of the frond taking root were selected, and the remainder left to increase and multiply, in their own peculiar way. The graceful little *Asplenium trichomanes* and *Aspidium Braunii*, both rare species here, were also noticed. On the side of the mountain where these ferns are found, many land shells were taken. The journey was then resumed in the rain, but frequent halts were made, now to collect a fern or dainty moss, now a Catocala moth, and again a fine specimen of the Ginseng, *Aralia quinquefolia*, whose bright fruit though hidden in the dense foliage on the mountain side had caught the watchful eye

of Mr. Fletcher. The scenery along the route was very beautiful and was enjoyed despite the rain. The road ran round and up and down the old Laurentides, which were clothed to their summits with maples, birches and other deciduous trees, showing softly through the mist all the changeful hues of autumn. As day advanced the rain abated, the clouds broke up, and some descending, hung upon the breasts of the mountains, adding new beauties to the ever changing scene.

Meech's Lake was reached and a brief stop made in one of the intervals of brightness which were ever inspiring the more sanguine with hopes of fair weather; but the rain coming on again, the journey was resumed. Near Mr. Tilley's cottage is a bay where *Limnaea megasoma* was found some years ago, and here a halt was ordered, and fine specimens of the much desired shell was soon obtained. Like other precious things, their number was limited; and the search for them was attended with much difficulty. One of the party in his eagerness lost his foot-hold on a slippery log and took an involuntary plunge into the lake. When he recovered his breath he declared the water was warmer than the air, but no one was thus induced to test the veracity of his statement. The work of collecting went merrily on, resulting in upward of thirty examples of *L. megasoma*, *L. Stagnalis* and *Physa Lordi* were also found. Lake Harrington was sighted about ten o'clock, but the mountain air had so whetted the appetites of the party, that it was unanimously decided to dine forthwith. Mr. Gillespie kindly placed his hospitable farm house at the disposal of the party. Boxes and baskets were opened, displaying all sorts of edible treasures, which, with tea freshly brewed and fragrant, soon disappeared from view. After the good dinner the weather brightened and the rain at last ceased to fall. Owing to a dam recently built across the outlet, the lake was found much above the ordinary level. Shells were few and far between along the shores. A group of islands nearly a mile up was said to afford numerous shells, but on visiting them in a boat, few specimens were found. *Unio complanatus*, *Limnaea Stagnalis*, *Physa Lordi*, *Planorbis hirsutus*, *Pl. Campanulatus* were however noted, and a plant, *Eriocaulon septangulare*, not known to occur nearer Ottawa than Masham.

Returning to the outlet near Alexander's Mill, search was made for *Anodonta undulata*, a fine form of which, resembling *A. Unadilla*

Dekay, was known to occur in the discharge from Meech's and other Laurentian lakes. For a time the stream afforded only *Physa Lordi*, and *U. complanatus*, but *A. undulata* was at last found. As the discovery of specimen after specimen was announced, one member of the party after another made his way into the water accoutered as he was; and soon the strange spectacle was presented, of five able bodied men, fully clothed, plunging their upper as well as nether limbs, into the stream and ejaculating at brief intervals, "I've another." "Every one to his trade, but this palls on me," was the remark of one of the natives, as he stood on the bridge and looked down upon the clam hunters. It would be of interest to know what he thought, and left unsaid. Notwithstanding his adverse criticism, the search was continued until the most avaricious conchologist expressed himself content. And well might he be! *A. undulata* was taken by the hundred, beautiful specimens in every stage of growth. Several *Magaritana undulata* were also found, the younger shells being of remarkable beauty. Time was flying, and as it was intended to visit another locality on Meech's lake before it became too dark for collecting, the return journey was begun at five o'clock, after another hearty meal. What with the rain and the plunging in mire and stream, every article of clothing was saturated. Fortunately the evening was warm and the road excellent. The desired point on Meech's lake was reached while it was yet daylight and a united advance was made into its waters. *L. megasoma* was again taken, and very large *Physa Lordi*. But one of the special objects of the excursion was the extraordinary form of *Planorbis bicarinatus* which Meech's lake and Brome lake of all the waters of America are alone known to furnish. About thirty-five specimens were obtained before a cloud settled down with darkness on the lake. The drive homeward was continued through a dense mist. Wet but happy, the party reached the city about nine, having collected forty one species of shells. The excursion was on the whole, one of the most successful ever made by the conchological branch of the club. L.

November, 1893.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 8.



THE BEAVER (*Castor Canadensis*, Kuhl).

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PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued October 31st, 1893.

Published Monthly at \$1.00 per annum.

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## FAUNA OTTAWAENSIS.

## HYMENOPTERA PHYTOPHAGA.

By W. HAGUE HARRINGTON.

The subjoined list, of that important section of the Hymenoptera which is most injurious to plant life, is offered as a contribution to the knowledge of our local Fauna. The list was prepared last winter and the numbers given for each species are those of the insects then in my collection, irrespective of such specimens as may have been given away or exchanged. These numbers are an indication of the relative abundance of the species and of the sex or sexes represented. The captures of the season just closed have not been arranged, but it is improbable that any additions have been made to the species previously captured. When they have been carefully examined, any items of interest regarding them will be recorded. The dates quoted for each species are the earliest and latest shown on the labels attached to individuals of that species. All the specimens are not, however, dated, and so no dates can be given for several of the species. All the species have been collected since the organization of the OTTAWA FIELD NATURALISTS CLUB, in the city or adjacent country, and several of the rarer species have been contributed by Mr. Fletcher and Prof. Guignard. Several of the species collected seemed apparently new to science and have been described by Provancher (*Faune Entomologique du Canada*, Vol. ii, Additions) or by the author (*Canadian Entomologist* Vols. xvi, xxv) and are those in the list of which types are indicated as in the collection.

## SUBSECTION PHYLLOPHAGA.

This division contains the species feeding upon the foliage of various plants, and consists of the family Tenthredinidæ, of which the adult insects are popularly, and appropriately known as Sawflies. The female has the ovipositor modified to form a more or less acutely toothed saw, with which a slit can be made in a leaf or twig for the reception of the egg. Some species have the saw feebly developed and make but a slight incision, or even (as the Gooseberry Sawfly) merely attach the egg

to the surface of the leaf. Other species have the instrument much stronger and are able to cut a groove even in the harder tissues, sufficient to entirely hide and protect the egg. The larvæ have a general resemblance to those of many Lepidoptera, and are often known as false-caterpillars. The greater number feed openly upon the leaves, but some produce galls, or are inquiline in the galls of other insects, and others are leaf-miners, or infest buds, etc. The species feeding openly are protected from their enemies in many different ways: as by assimilating to the colour of the foliage, emitting disagreeable odours or secretions, raising and lashing the abdomen about, feeding at night or on the under surface of the leaves, constructing shelters, etc. The immediate neighborhood has already yielded about one hundred and fifty species of Sawflies, but the true value and affinities of many forms cannot be known until they have been determined by breeding, for the larvæ and food-plants of comparatively few species are yet known to us. A list of the species collected in 1889 is given in Canadian Entomologist Vol. xvii, p. 23.

## TENTHREDINIDÆ.

### CIMBEX.

*C. americana*, Leach.—1 male, 1 female.

Var. *decemmaculata*, Leach.—2 males. May 11th.

Var. *alba*, Norton.—1 female.

Var. *LaPortei*, St. Farg.—3 males. June 16th.

This handsome and very variable insect is not common, but its larvæ are occasionally found on willow and elm.—They are yellow, with a black dorsal line, and a finely granulose appearance; when at rest they are coiled spirally on the leaf.

### TRICHIOSOMA.

*T. triangulum*, Kirby.—2 males and female. May 12th, July 28th.

Not a common insect, although the larvæ are not infrequent on willows. Seems to be more abundant farther north, as for instance at Sudbury.—Larvæ resemble those of Cimbex, but are green and without dorsal line.

## ABIA.

*A. Kennicotti*, Norton.—2 females from Mr. Fletcher.

## ZAREA.

*Z. inflata*, Norton (?)—1 female. May 11th.

This insect may be a var. of the preceding species, as the American genera and species are not well separated. It has the white band at base of abdomen which Cameron gives as distinguishing the British species of this genus from *Abia*.

## ACORDULECERA.

*A. dorsalis* Say.—4 males, 13 females. May 16th, August 2nd.

Occurs on Hickory and Oak; the larvæ gregarious and rapidly skeletonizing the leaves.

## HYLOTOMA.

*H. McLeayi*, Leach.—3 males, 8 females. May 10th, Aug. 2nd.

*H. clavicornis*, Fabr.—1 male, 5 females. June 13th, August 1st.

*H. scapularis*, Klug.—2 males, 3 females. June 10th, July 19th.

These species are found in the early part of the season on flowers of Service-berry, Choke-cherry, etc., and later on *Spiræa* and Goldenrod.

## CLADIUS.

*C. pectinicornis*, Fourcr. (*C. isomera*, Harris.)—1 male, 8 females.

May 24th, July 19th. This species (common in Europe) has been bred from larvæ feeding on roses and seems to be increasing in numbers. It is one of the three sawflies which are now well recognized as rose-pests.

## PRIOPHORUS.

*P. æqualis*, Norton.—2 males, 7 females. July 24th.

Bred from larvæ, feeding on willows, and found also on poplar.

## PRISTIPHORA.

*P. scycophanta*, Walsh.—1 male, 3 females. May 12th, June 26th.

*P. grossulariæ*, Walsh.—6 females. May 11th, June 28th.

*P. identidem*, Norton (?).—3 males. May 27th, July 12th.

These species are not separated very clearly and the last two should perhaps be combined.

## EUURA.

*E. orbitalis*, Norton.—6 males, 12 females. April, May.

These insects have been frequently bred from the galls on the stems of willows, and also from galls of *C. strobiloides*. Specimens vary considerably in size and coloration, but the differences do not seem to be great, or constant, enough to allow of separation, although following the descriptions they might be divided into almost as many species as have been erected by Walsh and Norton.

## NEMATUS.

*N. concolor*, Norton.—2 females. April 23rd.

*N. labradoris*, Norton.—1 female.

*N. malacus*, Norton.—2 females. May 8th and 18th.

*N. extensicornis*, Norton.—8 males. May 16th, June 5th.

*N. monela*, Norton?—1 female. June 6th, (from Mr. Guignard.)

*N. subalbatus*, Norton?—9 females. May 28th, June 5th.

*N. corniger*, Norton.—16 males, 15 females. May 17th, August 8th.

*N. pallicornis*, Norton.—13 males, 19 females. May 9th, June 13th.

*N. ventralis*, Say.—2 males, 7 females. May 24th, July 1st.

*N. saskatchewan*, Norton.—2 females. May 28th, June 6th.

*N. militaris*, Cress.—1 female.

*N. latifasciatus*, Cress.—1 male, 1 female. July 7th, Alder.

*N. erythrogaster*, Norton.—1 males, 7 females. June 5th, August 8th.

*N. Erichsonii*, Hartig.—1 male, 11 females. May 19th, June 23rd.

This imported species has devastated the larch forests of the Maritime Provinces and Quebec, and in Ontario has been also so abundant as to annually defoliate this tree. Its increase seems, however, to have been slightly checked, and during the past season the trees suffered less, apparently.

*N. pallidiventr*is, Fallén?—2 males, 5 females. August 26th.

This is apparently an imported species, and has been found infesting ornamental willows on the Central Experimental Farm. The females were ovipositing on the date given. It differs in some respects from *pallidiventr*is as described by Cameron, and may be a distinct species.

*N. rufocinctus*, Harr.—1 female. (Type) June 26th, Alder.

*N. bivittatus*, Norton.—2 females. May 17th, June 10th.

*N. thoracicus*, Harr.—1 female. (Type,) May 11th.

*N. similis*, Norton.—1 female. June 26th, Acacia.

*N. lineatus*, Harr.—1 female. (Type,) May 5th.

*N. ribesii*, Scop.—8 females. April 23rd, July 1st.

The larvæ of this species devour the foliage of the cultivated currants and gooseberry, and do serious damage when the plants are neglected. A simple treatment with hellebore proves very efficacious in staying their ravages, and a small parasite which has been found recently to attack the eggs, may perhaps aid in lessening the numbers of the pest.

*N. suadus*, Cress.—2 females.

*N. aureopectus*, Norton.—6 females. May 10th, 30th.

*N. pleuricus*, Norton.—1 female. May 9th.

*N. lateralis*, Norton.—1 female. May 9th.

*N. mendicus*, Walsh.—1 male, 9 females. May 9th, June 26th. Willow.

*N. s. pomum*, Walsh.—male and female. From Willow galls.

*N. gallicola*, Steph. (*Messa hyalina*, Norton?).—16 females. June and July. The galls of this species are very abundant on willows during the entire season.

*N. inquitinus*, Walsh?—1 female. August 15th.

*N. ocreatus*, Harr.—1 female. May 16th. (Type).

In addition to the 32 species (?) enumerated, there are a number of specimens not determined. The genus *Nematus* is so extensive that many of the species cannot be satisfactorily determined. When more of the species have been carefully bred, and when a thorough study is made of the genus, many of the species will doubtless prove to be but variations. Very many of the commoner species feed on willows, so that feeding is easy; the most difficult part of the breeding is the carrying through the pupæ when buried in the earth.

#### FENUSA.

*F. varipes*, St. Farg.—21 females. June 9th, August 26th.

Also a European species, which has badly infested alders at the

Experimental Farm, and has been found on native alders in Dows Swamp. The larvæ are miners and form brown blotches in the upper surface of the leaves.

## EMPHYTUS.

*E. apertus*, Norton.—2 males, 20 females. May 17th, August 18th.

*E. stramenipes*, Cress?—1 female.

*E. inornatus*, Say.—1 male, *var.*

*E. multicolor*, Norton. (*Strongylogaster multicolor*, Norton; *E. Hullensis* Prov.)—3 males, 5 females. June 3rd, 28th. (2 Types of *E. Hullensis*.)

*E. canadensis*, Kirby. (*E. pallipes*, Prov.)—8 females. May 24th, June 9th. Violets and Pansies.

*E. mellipes*, Norton.—2 males, 3 females. May 11th, June 12th.

*E. cinctus*, Linn. (*E. cinctipes*, Norton).—1 male (from Mr. Fletcher.)

This species has probably been introduced from Europe, and during the present year the larvæ have been noticed upon our garden roses, of which they promise to be another serious pest.

## HARPIPHORUS.

*H. tarsatus*, Say.—4 females. June 7th, July 19th.

Var. *varianus*, Norton.—5 males, 10 females. June 6th, 28th.

This fine species (rufous, or black, with white markings) occurs upon Cornels, growing along the Beaver Meadow, Hull.

*H. semicornis*, Say.—1 female. May 31st.

## DOLERUS.

*D. unicolor*, Beauv.—12 males. April 18th, May 12th.

*D. arvensis*, Say.—10 females. May 6th, June 7th. (= *unicolor*?)

*D. sericeus*, Say.—8 males, 2 females. April 23rd, May 27th.

*D. collaris*, Say.—5 females. May 10th, 30th.

*D. aprilus*, Norton.—12 males, 23 females. May 22th, Aug. 26th.

*D. albifrons*, Norton.—10 males, 7 females. May 24th, June 29th.

*D. apricus*, Norton.—2 females. May 24th, June 13th.

*D. similis*, Norton.—9 females. May 19th, June 24th.

*D. bicolor*, Beauv.—5 females. May 24th, 27th.

*D. abdominalis*, Norton.—2 males. May 21th, June 18th. (= *bicolor*?)

Nearly all the species of *Dolerus* are abundant in Spring, and are attracted to the sap oozing from stumps, etc., and to the alder and willows when in bloom.

## HEMICHROA.

*H. americana*, Prov. (*Dineura*)—1 female. June 26th. (Hull 1884.)

## BLENNOCAMPA.

*B. paupera*, Prov.—3 females. May 8th, 9th.

*B. parva*, Cress.—1 female. June 10th.

*B. carbonaria*, Cress (?)—1 female. June 19th.

## MONOPHADNUS.

*M. bardus*, Say.—1 male, 6 females. May 25th, June 23th.

The white larvæ of this handsome red-shouldered sawfly, feed on the foliage of the ash, and have sometimes completely stripped trees in this city.

*H. medius*, Norton.—2 males, 12 females. May 11th, July 12th.

*H. rubi*, Harris.—5 males, 8 females. May 12th, 27th.

The pale green, spiny larvæ of this species defoliate the wild and cultivated raspberry.

## PHYMATOCERA.

*P. fumipennis*, Norton.—8 males, 10 females. May 17th, June 14th.

*P. nigra*, Harr.—12 females. (5 Types) May 10th, 31st.

*P. montivaga* Cress. (?)—1 female.

## HOPLOCAMPA.

*H. halcyon*, Norton.—3 males, 15 females. May 11th, 17th. Shadbush.

## MONOSTEGIA.

*M. rosæ*, Harris.—16 females. May 19th, June 9th.

The slug-like larvæ of this species are very injurious to roses, and are more generally known than the larvæ of the two species (*C. pectinicornis*, and *E. cinctus*) already noted as infesting these favorite plants. The small black fly is very abundant in June.

*M. maculata*, Norton (*Emphytus*)—25 males, 63 females. May 1st, June 28th.

This species is a well-known pest of the strawberry, and its wing venation is very irregular (Insect Life Vol. 2. p. 227.)

*M. ignota*, Norton (?)—2 males, 2 females. May 27th, 31st.

#### SELANDRIA.

*S. flavipes*, Norton.—14 males, 12 females. May 24th, Aug. 8th.

A common species upon ferns, on which the larvæ feed.

#### SCIAPTERYX.

*S. punctum*, Prov.—2 males, 2 females. June 27th, July 8th.

#### ALLANTUS.

*A. robustus*, Prov.—1 female. (Type.)

*A. basilaris*, Say.—4 males, 13 females. June 28th, Aug. 7th.

This species is abundant in July upon goldenrod and spiræa, and is partially predaceous in its habits.

#### MACROPHYA.

*M. flavicoxæ*, Norton.—8 males, 28 females. May 30th, July 8th.

*M. albilabris*, Harr.—1 male. (Type. var *flavicoxæ*?)

*M. externa*, Say.—2 females. June 26th.

*M. tibiator*, Norton.—1 male, 1 female. June 28th.

*M. contaminator*, Prov.—4 females. June 26th, July 12th.

*M. propinqua*, Harr.—4 females. (Types.) July 5th, 26th.

*M. nigra*, Norton.—5 females. June 24th, 28th.

*M. albomaculata*, Norton.—1 male, 8 females. June 4th, July 5th.

*M. trisyllaba*, Norton.—9 males, 36 females. June 6th, Aug. 1st.

This is the most common of our species of Macrophyta, and occurs abundantly upon nettles growing in damp woods.

*M. varia*, Norton.—2 females. June 20th, 28th.

*M. trosula*, Norton.—1 female. June 10th, (from Mr. Guignard 1885.)

*M. fascialis*, Norton.—2 females. June 26th, July 5th.

#### PACHYPROTASIS.

*P. omega*, Norton.—1 male, 4 females. June 28th, July 28th.

*P. delta*, Prov.—40 males, 24 females. May 31st, July 12th.

This species, abundant in swampy margins of woods, is very variable in wing venation, (Can. Ent. vol. xviii, p. 32.)

*P. varipicta*, Harr.—2 males, 1 female. (Types.) June 7th, 10th.

#### TAXONUS.

*T. nigrisoma*, Norton.—11 males, 2 females. May 24th, June 5th.

*T. rufipes*, Harr.—3 males. (2 Types.) May 8th, 18th.

*T. dubitatus*, Norton.—19 males, 14 females. May 28th, July 19th.

*T. albidopictus*, Norton.—4 males, 20 females. May 24th, Aug. 2nd.

*T. uncinatus*, Norton.—3 females. May 27th, 30th.

#### STRONGYLOGASTER.

*S. pallioxus*, Prov.—1 male, 13 females. (2 Types.) May 30th, June 23rd.

*S. proximus*, Prov.—3 females. (1 Type,) July 25th.

*S. rufocinctus*, Norton.—6 males, 5 females. June 13th, July 11th.

*S. epicera*, Say.—2 males, 7 females. May 29th, June 27th.

*S. terminalis*, Say.—2 females. June 23rd, 28th.

*S. apicalis*, Say.—4 males, 9 females. June 13th, July 28th.

*S. pallidicornis*, Norton.—1 male, 2 females. July 18th, 26th.

*S. longulus*, Norton.—4 males. May 24th, June 3rd.

*S. luctuosus*, Prov.—1 male, 2 females. (1 Type,) May 22nd, 28th.

*S. distans*, Norton (?)—1 female. (taken alive from an ant.)

*S. soriculatus*, Prov.—1 male, 2 females. May 24th, June 3rd.

*S. annulosus*, Norton.—4 females. May 24th, June 3rd.

*S. tacitus*, Say.—2 males, 3 females. May 24th, August 8th.

#### PÆCILOSTOMA.

*P. albosecta*, Prov.—1 female. June 10th, Dow's Swamp.

#### TENTHREDO.

*T. grandis*, Norton.—5 males, 9 females. June 13th, July 19th..

Var. *nigricollis*, Kirby (?)—1 female. June 15th.

*T. rufipes*, Say.—10 females. June 2nd, August 2nd.

*T. rufopictus*, Norton.—5 males. 11 females, June 5th, July 1st.

*T. lineata*, Prov.—3 females. June 21st.

*T. ventralis*, Say.—7 females. June 23rd, August 2nd.

- T. verticilis*, Say.—6 males. 18 females, June 4th, July 26th.  
*T. basilaris*, Prov.—5 females. June 9th, August 2nd.  
*T. semirubra*, Norton.—1 female.  
*T. signata*, Norton.—2 males. June 27th.  
*T. rufopediba*, Norton.—3 males. June 28th, (= *signata* ?)  
*T. eximia*, Norton.—1 male, 1 female. May 24th, June 28th.  
*T. semicornis*, Harr.—1 male. June 9th, (Type from Mr. Guignard.)  
*T. mellina*, Norton.—1 male, 5 females. June 12th, July 19th.  
*T. ruficolor*, Norton.—2 females. May 24th, July 1st, (= *mellina* ?)

## TENTHREDOPSIS.

- T. atrovioleacea*, Norton.—9 males, 9 females. June 1st, June 30th.  
*T. 14-punctata*, Norton.—2 males, 2 females. May 31st, June 7th.  
*T. Evansii*, Harr.—1 female. (Mr. Fletcher.) (= *Tenthredo viridis*, Linn?  
*T. (?) annulicornis*, Harr.—1 male, 1 female. (Types) May 28th,  
 June 6th. Perhaps two species.

## LOPHYRUS.

- L. Lecontei*, Fitch.—5 females. May 19th.

The larvæ of this species feed upon the red pine; they are yellowish with black markings. Bred flies emerged in April.

- L. abietis*, Harris.—2 males, 8 females. June 12th, July 22nd.

This is a much commoner species, the larvæ feeding upon the spruce. They are greenish with darker longitudinal stripes. Cocoons much smaller and paler, frequently parasitized.

## MONOCTENUS.

- M. fulvus*, Norton.—3 males, 6 females. May 7th, June 6th.

Larvæ larger and more yellowish, feeding upon cedar.

## PAMPHILIUS. (Lyda.)

- P. maculiventris*, Norton.—3 males, 1 female. June 12th, 26th.  
*P. marginiventris*, Cress.—2 females. May 7th, 24th. (= var. *maculiventris*. ?)  
*P. luteomaculatus*, Cress.—3 females. May 24th. (= var. *maculiventris* ?)  
*P. ruficeps*, Harr.—1 female. May 31st. (Type; = var. *brunniceps*, Cr. ?)  
*P. perplexus*, Cress.—4 males, 2 females. May 11th, 28th.

- P. canadensis*, Norton.—2 females. June 7th.  
*P. excavatus*, Norton.—1 male.  
*P. quebecensis*, Prov.—2 females. June 27th, 30th.  
*P. pallimaculus*, Norton.—4 females. June 6th, 7th.  
*P. ocreatus*, Say.—1 female.  
*P. rufofasciatus*, Norton.—3 females. June 26th, July 26th.  
*P. cinctus*, Harr.—1 female. June 28th. (Type.)  
*P. Harringtonii*, Prov.—1 female. (Type.)  
*P. luteicornis*, Norton.—1 male, 2 females. June 2nd, 12th.

#### MACROXYELA.

- M. infusata*, Norton.—1 female.

This specimen was taken near the city two years ago by my son then about nine years of age, and is the only one I have seen.

#### XYELA.

- X. minor*, Norton.—1 male, 10 females. June 8th, 16th. Spruce.

#### SUBSECTION XYLOPHAGA.

This limited division contains the few species which feed internally upon the pith, or woody tissues of the plants infested. The ovipositor of the female, instead of being saw-like, is more prolonged, and is so constructed that it forms a regular borer, which in the larger species can pierce even the solid wood of our forest trees, in which the eggs are deposited and in which the larvæ live. These larvæ are somewhat elongated white grubs, having only rudimentary legs and thus approaching more closely the ordinary footless grub of the Hymenoptera, than do saw-fly larvæ. The species of Xylophaga are all included in one family, the Uroceridæ, and only five genera are represented in Canada. The larvæ of *Cephus* infest the stems of grasses or the twigs and shoots of various shrubs; those of *Oryssus* and *Xiphydria* bore into the trunks of maple, willow, poplar, etc., those of *Tremex* inhabit chiefly old maples and beeches, while those of *Urocerus* confine their attacks to the conifers which they sometimes seriously injure.

## UROCERIDÆ.

## CEPHUS.

*C. pygmæus*, Linn.—1 female. (sent to, and identified by Mr. Ashmead.)

*C. bimaculatus*, Norton.—2 females. May 30th.

One of these was ovipositing in a twig of *Viburnum lentago*.

*C. trimaculatus*, Say.—1 female. June 16th.

## ORYSSUS.

*O. Sayi*, Westwood.—1 male, 1 female. Maple.

var. *affinis*, Harris.—6 males. May 29th. June 13th. Maple.

var. *terminalis*, Newm.—10 females. June 3rd, 23rd. Maple.

var. *occidentalis*, Cress.—1 male, 1 female. May 30th, 31st. Maple.

## XIPHYDRIA.

*X. albicornis*, Harris.—4 males, 15 females. June 16th, July 6.

This species frequently attacks maples planted in the city streets.

*X. Provancheri*, Cress.—1 female. June 15th. Maple. Hull.

*X. rufiventris*, Cress.—1 female. (from Mr. Fletcher.)

*X. attenuata*, Norton.—2 males. Basswood.

## UROCERUS.

*U. cyaneus*, Fabr.—2 males, 9 females. Sept. 16th, Oct. 2nd.

*U. albicornis*, Fabr.—4 females. Aug. 22nd, 26th.

*U. abdominalis*, Harris.—12 males. June 22nd, Aug. 13th. Larch.

These are probably the males of *albicornis*, although so different.

*U. flavicornis*, Fabr.—1 female. (coll. Mr. Fletcher.)

## TREMEX.

*T. columba*, Linn.—2 males, 17 females. July, Oct.

This is a common species which badly infests old maples and beeches, and frequently emerges from sticks of firewood. Females may often be found which have not been able to withdraw their ovipositors from the wood in which they were boring, and have been held there until they perished.

## BOOK NOTICES.

Notes on the Gasteropoda of the Trenton limestone of Manitoba, with a description of one new species, by J. F. Whiteaves of the Geological Survey of Canada. *Canadian Record of Science*, April 1893, pp. 317-328.

This paper is one of a series on the Cambro-Silurian fossils of Manitoba. The author's reports on the Orthoceratites of the Winnipeg basin, published in the Royal Society's Transactions for 1891 and 1892, are well known, whilst the remainder of the fauna of these Palæozoic rocks will no doubt be shortly described.

Mr. Whiteaves has had access to all the collections made by officers of the Geological Survey; to specimens obtained during the Saskatchewan Exploring Expedition of 1858; to those collected by Hudson Bay officers and to notes on those of Sir John Richardson, and other Arctic explorers. The present report forms, therefore, an important contribution to the geological history of those interesting and important regions of Canada.

Amongst the collections received were those made by Prof. H. Y. Hind in 1858, by Dr. Selwyn in 1872, by Dr. Bell in 1879 and 1880, by Messrs MacCharles and Weston, in 1884; by Mr. Tyrell in 1889 and 1890, and by Messrs Dowling and Lambe in 1889-90. The collections are from the following localities:—East Selkirk, Lower Fort Garry and Nelson River (in Keewatin,) on the mainland and Big, Elk, Deer, Birch, Snake, Bereus, Jack Fish, Sturgeon, Black Bear and other islands in Lake Winnipeg. Sixteen species of Trenton Gasteropoda are recorded, as follows:—

## TRENTON GASTEROPODA.

1. *Raphistoma lenticulare*, Hall.
2. *Pleurotomaria subconica*, Hall.
3.       "       *muralis*, D. D. Owen.
4. *Murchisonia Milleri*, Hall.
5.       "       *gracilis*, Hall.
6.       "       *bellicincta*, Hall, var. *teretiformis*, Billings.

7. *Bucania (Tremanotus?) Buelli*, Whitf.
8. *Bucania sulcatina*, Emmons.
9. " *bidorsata*, Hall.
10. *Cyrtolites compressus*, Conrad.
11. *Eunema strigillatum*, Salter.
12. *Helicotoma planulata*, Salter.
13. *Trochonema umbilicatum*, Hall.
14. *Maclurea Manitobensis*, Whiteaves.
15. *Loxonema Winnipegense*, N. sp.
16. *Fusispira ventricosa*, Hall.

Of these, *Loxonema Winnipegense* is the only new form to Science, "The species is of considerable interest" Mr. Whiteaves remarks, "on account of its striking and close similarity to some of the most typical Jurassic species of *Pseudomelania*." The large operculum which was found associated with the *Maclurea Manitobensis*, Whiteaves, (Trans. Royal Society Canada, vol. VII., Sect 4., p. 75. pls., XII and XIII figs. 1 and 2.,) is of interest, in that it does not possess a muscular process such as is seen in the operculum of *Maclurea Logani*, Salter of this district. Of the sixteen species recorded, no less than eleven are forms which were more or less abundant in the old Cambro-Silurian seas about Ottawa, and whose remains we now find imbedded in the rocks of old Barrack Hill, of Hull and of the Black River and Trenton formations of the Ottawa Valley generally. The fauna as exemplified in the gasteropoda appears to be nearer Black River than Trenton, although the two belong to one and the same period in the history of this portion of the North American Continent.—H. M. AMI.

Report of the U. S. National Museum, under the Direction of the Smithsonian Institution, for the year ending June 30th, 1890.

This volume of 800 pages contains a most interesting collection of reports and scientific papers. In addition to the reports of the Assistant Secretary and of the Curators of the several departments of the Museum, there is a series of most valuable papers, discussing and illustrating the

collections therein. But brief mention can be made of a few of the papers, the first of which is by Robert Ridgeway on "The Humming Birds," covering 130 pages and illustrated by 46 plates of the many species enumerated. "The Methods of Fire Making," by Walter Hough gives the various ways in which primitive people secured the all essential fire. Prof. Romyn Hitchcock contributes two very interesting papers, one on the "Ainos of Japan," a race which at one time probably inhabited the whole empire, but which is now a scanty people in the island of Yezo; the other on the evidences of a race which may have preceeded the Ainos and which are designated as "The Ancient Pit Dwellers of Yezo. The first part of a "Handbook for the Department of Geology" appears and deals with Geognosy, or the materials of the earth's crust, by Geo. P. Merrill.—(ED.)

Birds of Michigan.—Bulletin 94, Michigan Agricultural College. Prof. A. J. Cook.

The Michigan Experiment Station here furnishes to its supporters a very valuable catalogue of the birds recorded from the State, many of which are illustrated in part or in whole—The species recorded number 332, and as the fauna of Michigan agrees in general with that of Ontario the members of the club will find the work of Prof. Cook to be of much interest and value to them in the study of our own bird fauna.—(ED.)

## BOTANY.

Edited by W. SCOTT, B.A.

*Veronica Buxbaumii* at Quebec.—I have received from Miss Alice Bowen of Quebec, some nice specimens of the above pretty little Speedwell, which is such an attractive feature of the English hedgerows. "The plant was found in an old, neglected, garden flower-bed" at Quebec. This species is recorded by Macoun as a ballast plant from North Sydney, and Pictou, N. S., and by Burgess from Kingston and London, Ont.—J. F.

## CONCHOLOGY.

Edited by F. R. LATCHFORD, B.A.

Several hundred *Helix rufescens* and *H. Cantiana*, collected at Quebec, with probably a thousand eggs of the latter species, have been set out on the Exhibition Grounds west of Machinery Hall. The place selected is quite undisturbed, even when other portions of the grounds are thronged with people; and as it is easy of access frequent observations may be made of the success or failure of these shells to exist so far inland. Both species have made their way into Canada from England and are now as firmly established on Cape Diamond as the flag which they followed across the sea. *H. rufescens* abounds throughout the City of Quebec, at Levis, and on the Island of Orleans. *H. Cantiana* appears to be restricted to two localities on the escarpment of the Cape; and this may account for the fact that the shell escaped notice until 1885. It is not known to occur elsewhere in America, and its struggle for existence here will be watched with interest.—L.

Another shell, *H. harpa*, small but beautiful and a native of our northern clime, though not hitherto known to occur in this vicinity, has also been introduced on the peninsula, near Machinery Hall. More than a hundred mature individuals from Ste. Petronille, on the Island of Orleans, have been placed among just such bracken and poplars, as they had been taken from a few days before.—L.

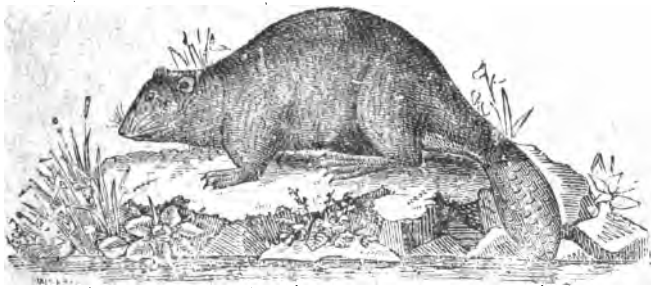
## NOTICE TO MEMBERS.

The Soiree Committee is about to arrange the programme of evening meetings for the winter season, and desires that any member who may wish to read a paper, or to have one presented, will without delay furnish the title of his proposed paper, and the date on which it will be completed. The Leaders of the several Branches, will be glad to have notes of any objects of special interest which have been observed during the past season, to assist them in preparing the reports of the Branches. The Treasurer finds that many members have apparently forgotten that the annual subscription fee is payable in advance, and that money is needed monthly for the payment of printer's bills and postage. (Ed.)

December, 1893.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 9.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued December 5th, 1893.

Published Monthly at \$1.00 per annum.

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1893—OTTAWA FIELD-NATURALISTS' CLUB—1894.

LECTURES AT 8 P.M. IN NORMAL SCHOOL, OTTAWA.

Dec. 12th.—Inaugural Address: The extinct Northern Sea-cow and  
early Russian Explorations in the North Pacific.

Dr. G. M. Dawson, C.M.G., F.R.S.

Jan. 9th.—Following a Planet. (*With lantern illustrations*)

A. McGill, B.A., B.Sc.

Jan. 23rd.—Biological Water Analysis. (*With lantern illustrations.*)

Dr. Wyatt Johnston, Montreal.

Feb. 6th.—How Rocks are Studied.

Frank Adams, Ph.D., (McGill College, Montreal.)

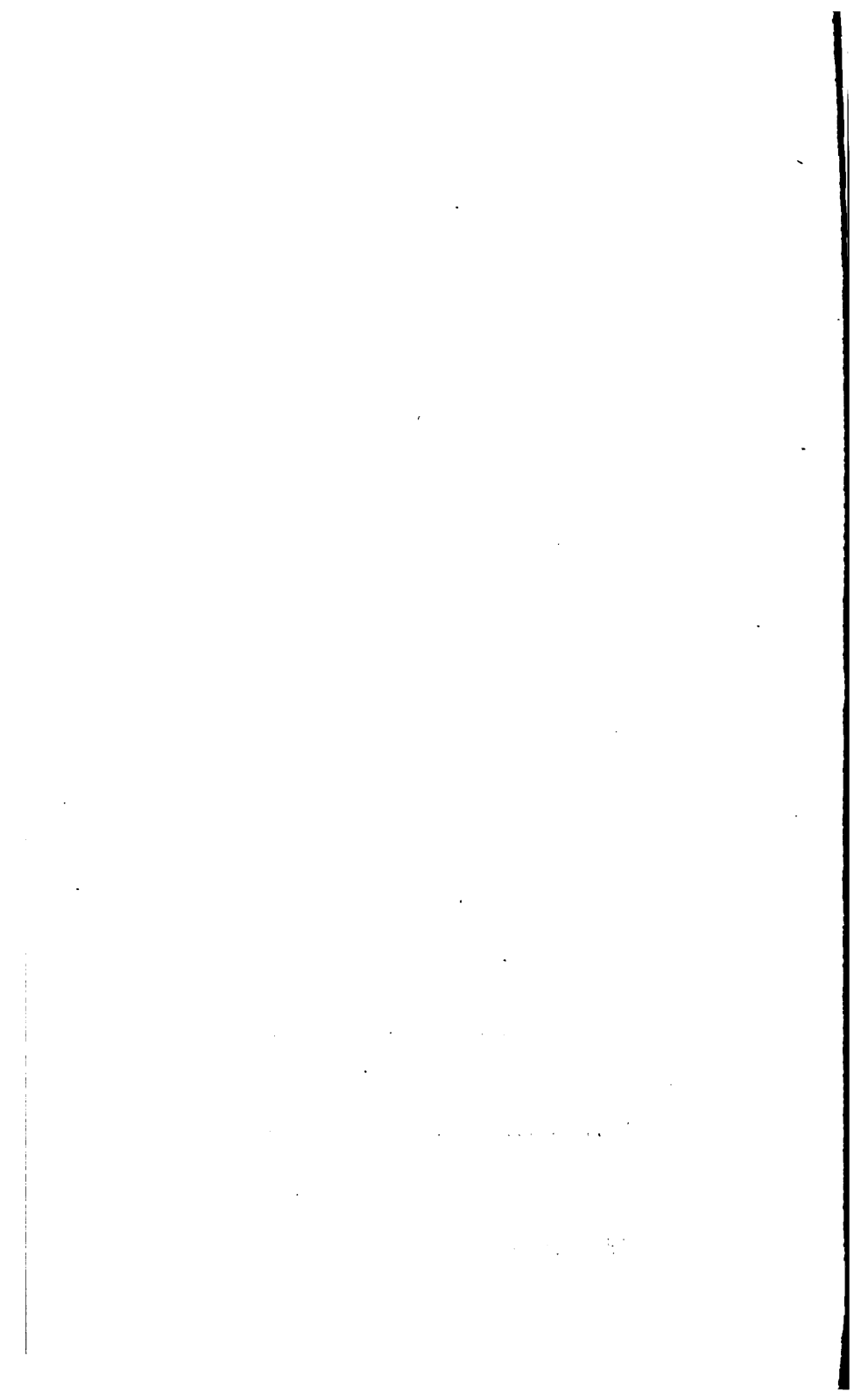
Feb. 26th.—The Transmutations of Nitrogen. (*With chemical ex-  
periments.*)..... Thos. Macfarlane, F.R.S.C.

Mch. 6th.—Ottawa Butterflies..... James Fletcher, F.R.S.C.

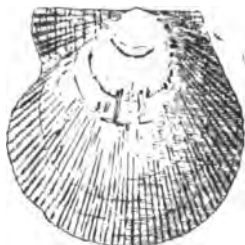
Notes on the Natural History of the Islands of Behring  
Sea..... James H. Macoun.

---

Mch. 20th. Annual Meeting at 4 p.m.







1



1 a.



2



2 a.

# NOTES ON SOME MARINE INVERTEBRATA FROM THE COAST OF BRITISH COLUMBIA. I

By J. F. WHITEAVES.

## ECHINODERMATA.

### STRONGYLOCENTROTUS FRANCISCANUS, A. Agassiz.

This littoral species was recorded by the writer as having been collected by Mr. James Richardson in 1874 at Sooke, in the Strait of De Fuca. Dr. G. M. Dawson found it to be the common sea urchin of the Queen Charlotte and Vancouver islands, and especially abundant in localities exposed to the open sea, although its name was inadvertently omitted in the published lists of Echinoidea in his 1878 and 1885 collections. Specimens of it were obtained at Qualicum, V. I., by Professor Macoun in 1889.

## MOLLUSCA.

### PELECYPODA.

#### PECTEN (PSEUDAMUSIUM) VANCOUVERENSIS. (Sp. nov.)

Plate 1, figs. 1 and 1 a

Shell small, equivalved, compressed lenticular, both valves being equally convex, ovately subcircular in outline apart from the ears and rather oblique: valves extremely thin and fragile, translucent and almost transparent, pale horn colour with a slightly yellowish hue. Beaks placed a little behind the midlength; hinge line straight and very long; ears unequal in size, the posterior pair, which are much smaller than the anterior, alike, indistinctly defined and merging gradually and imperceptibly into the general convexity and marginal contour of that side of each valve; anterior ears large, subtriangular, prolonged laterally and longer than high, distinctly defined, that of the left valve somewhat convex in outline above and concave below, that of the right valve with a deep and acutely angular byssal sinus at its base.

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1. Communicated by permission of the Director of the Geological Survey Department.

Surface marked by densely crowded and exceedingly minute, irregular and rarely continuous, but on the whole radiating, simple or bifurcating raised lines, also by comparatively large, regularly disposed and distant squamose radii. In the centre of each valve the minute and non-squamose raised lines are essentially parallel to the larger squamose radii, but on the sides the former are disposed obliquely to the latter. The surface of the anterior ear of each valve is minutely cancellated with extremely minute raised lines, which are almost parallel to the hinge line, in addition to the coarser cross lines. The whole sculpture of the exterior of the test is far too minute to be clearly seen without the aid of a microscope or powerful simple lens, but under either of these a few faint concentric lines of growth are also visible.

Dimensions of the only specimen that the writer has seen : height, from beaks to base, 7.50 mm.; maximum length, 7.75 mm.; greatest thickness through the closed valves, 2.25 mm.

Forward Inlet, Quatsino Sound, Vancouver Island, in ten to twenty fathoms mud, Dr. G. M. Dawson, 1885 : one living specimen.

In the list of specimens collected by Dr. Dawson in that year, the little shell upon which the foregoing description is based, was erroneously identified with the *Pecten Alaskensis* of Dall. A subsequent study of its characters, has led to the conclusion that it is much more nearly related to *Pecten vitreus*, Chemnitz, and *P. abyssorum*, Loven, from both of which it can be readily recognized by its very peculiar sculpture. *P. Alaskensis* has opaque and much thicker valves and different surface markings. Its posterior auricles are distinctly defined and its anterior auricles very much smaller in proportion to the size of the shell, than those of *P. Vancouverensis*. The credit of first distinguishing between the species last named and *P. Alaskensis* is due to the Rev. G. W. Taylor, of Victoria, V.I., who informs the writer that he has two specimens in his collection dredged in about ten fathoms sand, Departure Bay, near Nanaimo, in 1888.

#### CARDIUM (FULVIA) MODESTUM, Adams and Reeve.

The shell for which the name *Cardium Richardsons* was proposed in the Canadian Naturalist for December, 1878, was described as a new

species almost entirely upon the authority of the late Dr. P. P. Carpenter. Dr. W. H. Dall, however, regards both the *Cardium* var. *centiflosum*, Carpenter, and *C. Richardsoni* as synonyms of *C. modestum*.

CUMINGIA CALIFORNICA, Conrad.

Barclay Sound, on the south west coast of Vancouver Island, Professor Macoun, 1887 : one perfect specimen.

MACOMA YOLDIFORMIS, Carpenter.

Forward Inlet, Quatsino Sound, in ten to twenty fathoms mud, Dr. G. M. Dawson, 1885 : one fresh and perfect right valve.

PSAMMOBIA RUBRORADIATA, Nuttall.

Barclay Sound, Vancouver Island, Professor Macoun, 1887 : four fresh valves. One dead shell of this species had previously been collected by Dr. Dawson in 1878 at the mouth of Cumshewa Harbour, Q.C.I.

GASTEROPODA.

EMARGINULA CRASSA, J. Sowerby.

An adult shell of this species, with the animal, was found in a jar containing large specimens of *Solaster Stimpsoni*, *S. Dawsoni*, *Cribrella laeviuscula* and other starfishes characteristic of the British Columbia marine fauna, preserved in alcohol, the contents of which, except the alcohol, were stated by Dr. Dawson to have been dredged by him at the Queen Charlotte Islands in 1878.

PACHYPOMA INEQUALE, Martyn.

This shell, which is very common in the Vancouver region, was identified by Dr. P. P. Carpenter with *P. gibberosum*, Chemnitz (sp.), but Dr. Dall says that "Martyn's name is four years older," and therefore should be retained for it.

TURCICULA CIDARIS, A. Adams. (Sp.)

Plate 1, figs. 2 and 2 a.

*Margarita Cidaridis* (A. Ad.) Carpenter. 1864, Ann. and Mag. Nat. Hist., 3rd series, vol. xiv, p. 426.

*Solariella* (*Turcicula*?) *cidaris*, Pilsbry. 1889. Cont. of Tryon's Man. Conch., vol. xi, p. 331.

*Solariella cidaris*, Williamson. 1892. Proc. U. S. Nat. Mus., vol. xv, p. 202, pl. xxii, fig. 4.

The only figure of this beautiful shell that has yet been published represents an enlarged ventral view of an apparently immature Californian specimen, twenty-eight millimetres in height, which is stated by Mrs. M. Burton Williamson (op. cit.) to have been dredged in deep water off the islands in San Pedro Bay by the U. S. Fish Commission. The Canadian specimen, of which two views are given on Plate 1, is the only adult shell that the writer has seen, and measures forty-six millimetres in height (or length) by about thirty-two in maximum breadth. It was dredged by Dr. Dawson, in 1885, in thirty fathoms, sand, gravel and dead shells, off False Head, Queen Charlotte Sound, where several smaller specimens were obtained, as already recorded on page 128 (Section 4) of the fourth volume of Transactions of the Royal Society of Canada. In the adult shell the outer lip is somewhat thickened and its nacreous interior is margined by a narrow white porcellaneous rim.

#### BELA SCULPTURATA, Dall.

*Bela sculpturata*, Dall. 1886. Proc. U. S. Nat. Mus., p. 299, pl. iv, fig. 7.

"Queen Charlotte Islands and Vancouver district," Dall.

#### ODOSTOMIA SITKENSIS, Dall.

Dolomite Narrows, Queen Charlotte Islands, Dr. G. M. Dawson, and since collected by Dr. Dawson in 1885 at False Bay, Lasqueti Island, as recorded in the fourth volume of Transactions of the Royal Society of Canada.

#### TRITON (PRIENE) OREGONENSIS, Redfield.

The radula of a Vancouver specimen of this species is essentially similar to that of *Triton* as figured by Wilton in Woodward's Manual of the Mollusca, and Fischer's Manuel de Conchyliologie, its dental formula being 6. 9. 6.

## BUCCINUM POLARE, var. PERCRASSUM.

Near Victoria, V. I., J. Richardson, 1875, two dead specimens. Off False Head, Queen Charlotte Sound, in thirty fathoms, Dr. G. M. Dawson, 1885; one specimen. These three shells were named *Buccinum polare*, var. *compactum* by the writer, on the authority of Dr. Dall. The writer, however, has recently been informed by Dr. C. F. Newcombe, of Victoria, that, in a letter received by him on the second of November last, Dr. Dall writes that the word *compactum* is probably a *lapsus* for *percrassum*, and that his *B. polare*, var. *percrassum* was "figured and described in the new edition of Martini and Chemnitz's Conch. Cabinet, Suppl., p. 189, pl. 91, fig. 5." In the official report on the expedition to Point Barrow, Alaska, published at Washington in 1885, Dr. Dall contributes a chapter (vi) on the mollusca obtained. On page 180 of that volume, under the head *Buccinum polare*, Gray, Dr. Dall makes the following remarks. "I have seen two specimens of a singularly thick and short variety *percrassum* from the Arctic north of Bering Strait. It must be exceedingly rare; the upper whorls are smaller, less inflated and less turreted than in the normal form. The operculum is also proportionally larger and more oval. It may prove distinct from *polare*." But in the explanation of the plate of Point Barrow Mollusca, in that volume, fig. 9 is said to represent "*Buccinum plectrum*, Stm., *forma percrassa, minor*."

## ONCHIDELLA BOREALIS, Dall.

North side of Queen Charlotte Sound, between tides, Dr. G. M. Dawson, 1885; several specimens.

## EXPLANATION OF THE PLATE.

## PLATE I.

## PECTEN (PSEUDAMUSIUM) VANCOUVERENSIS.

Fig. 1. Side view of the type specimen, four times the natural size, and showing the left valve.

" 1 a. Another view of the same specimen, to show the right valve.

## TURRICULA CIDARIS.

Fig. 2. Dorsal view of an adult shell of this species. Natural size.

" 2. a. Ventral view of the same, showing the aperture and operculum.

# NOTES ON THE GEOLOGY AND PALÆONTOLOGY OF THE ROCKLAND QUARRIES AND VICINITY, IN THE COUNTY OF RUSSELL, ONTARIO, CANADA.

BY HENRY M. AMI, M.A., D. Sc.

On the 24th of June last, the OTTAWA FIELD NATURALISTS' CLUB held a very successful excursion to the new Rockland quarries. These are situated about two miles to the south-east of the village of Rockland, in the Township of Clarence, in the County of Russell, Ontario, and were opened with a view of obtaining the stone required for the construction of the Soulanges canal. This locality proved to be very interesting to the geologist, from the fact that six distinct Palæozoic formations were met and examined. Mr. Archibald Stewart, government contractor and proprietor of the new Rockland quarries, and Mr. W. C. Edwards, M. P. for Russell, had extended to the Ottawa naturalists a hearty invitation, and made them welcome. Everything went off well and the day was thoroughly enjoyed by all. Refreshments and conveyances were freely supplied by these two gentlemen, and the excursionists duly appreciating their kindness, unanimously thanked them for their hospitality.

## GEOLOGICAL FEATURES OF ROCKLAND.

The following are the different geological formations met with at Rockland, between the mills on the Ottawa River front, and the new quarries, some two miles distant, in descending order. These formations succeed each other in regular order, as seen in the table, with only two unconformities, the first below the glacial drift, and the second below the Potsdam formation. They occupy that zone of country lying between the escarpment at the quarries and the Ottawa River. This escarpment is similar in origin and aspect, to the bluffs and escarpments at Ottawa, and formed at one time the southern shore or cliff-margin of the Pre-glacial stream which flowed from the west in almost precisely the same channel as does the Ottawa River at present.

The Calciferous and Chazy formations form the widest belts, whilst the Trenton, Black River and Chazy formations, are the most fossiliferous in the district.

## GEOLOGICAL FORMATIONS AT ROCKLAND, CO. RUSSELL, ONTARIO.

System.	Formations.	Thickness in Feet.	Fossil Remains.
I. Post-Tertiary.....	1. Fluvatile.....	Various .....	None observed.
	2. Leda clay.....	Rep. to 25 feet....	
	3. Glacial clay, etc..	Various .....	
HERE AN UNCONFORMITY OCCURS.			
II. Ordovician.....	4. Trenton.....	About 50 ft.....	Abundant.
	5. Black River.....	" 75 ft.....	Not rare.
	6. Chazy.....	" 60 ft.....	Abundant.
	7. Calciferous .....	" 50 ft.....	None observed.
	8. Potsdam.....	" 75 ft.....	ScolithusCanadensis.
HERE THE SECOND UNCONFORMITY OCCURS.			
III. Archæan.....	9. Laurentian.....	Several thousand ft.	None observed.

## THE LAURENTIAN OUTCROP.

The basal beds of the Potsdam formation are seen to lie unconformably over the denuded and rounded, or irregular surface of the Archæan or Laurentian rocks. These consist of rather coarsely crystalline gneisses and mica schists, along with hornblendic rocks, whose petrographical relations and characters deserve special study. They furnished the material which helped in the building up of the subsequent formations, the quartz of the Potsdam sandstones having been derived from the granitoid gneisses of this vicinity.

## THE POTSDAM.

The Potsdam formation at Rockland Mills forms a more or less irregular zone of heavy bedded, light greyish blue or white colored sandstones, which at times become glassy in appearance and give the formation a truly quartzite character. Nevertheless, the grains of quartz may be easily detected, and are cemented together for the most part by silica.

Some of the bands carry iron pyrites, and weather rusty-coloured. The clear and white, or light coloured bands appear to be fit for glass making. The outcrop of this formation near the Ottawa River front, at the Rockland Mills, belongs to the lower portion of the Potsdam. The higher beds of the formation in the Ottawa Valley are finer grained, and have the grains of quartz in the sandstone less coherent, and the beds themselves are less massive and reduced in thickness, often presenting the well known tracks of *Protichnites* as at Montebello, Papineauville and above that again,\* eight miles below the mouth of the South Indian River.

#### THE CALCIFEROUS AND CHAZY.

These two formations occupy their regular and respective positions, one below the other, both as regards their geological and geographical relations at Rockland. The zone of farming or pasture land, between the escarpment at the quarries and the town, is occupied by these two formations, whilst the soil is made up to a great extent of the debris of the Chazy, which is the softest and most easily denuded and disintegrated formation in the district.

None of the characteristic fossils of the Calciferous formation were found on this occasion, but at the turn of the road on the hillside about  $1\frac{1}{2}$  miles south of Rockland the typical shales of the Chazy formation crop out and are fossiliferous. These overlie the fine-grained and compact limestones, on which Mr. Edwards' celebrated stock and breeding stables are built.

These limestones are characterized by the presence of concretions or inclusions of irregular masses of pink calcite varying in size and intensity of colour. There are two or three bands of these limestones, which, both in Nepean and elsewhere, have been utilized or described as "cement-rock." This is the same band of limestone which crops out at the Hull cement quarries, Skead's mill, Ont., also at Hog's Back, and again on a lot the property of Mr. T. M. Clark, of New Edinburgh close to Hemlock Lake.

The following species of fossils have been recognized by the writer in the dark and chocolate coloured and purple, calcareo-argillaceous

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\*Geology of Canada, 1863, p. 94.

shales of the Chazy and in the accompanying calcareous bands:

*Fossils from the Chazy Beds.*

1. *Orthis imperator*, Billings.
2. " *borealis*, Billings.
3. " *platys*, Billings.
4. *Rhynchonella plena*, Hall.
5. *Raphistoma staminea*, Conread.
6. *Modiolopsis parviuscula*, Billings.
7. *Orthoceras antenor*? Billings.

But little time was spent collecting here, which accounts for scarcity of forms.

BLACK RIVER AND TRENTON FORMATIONS.

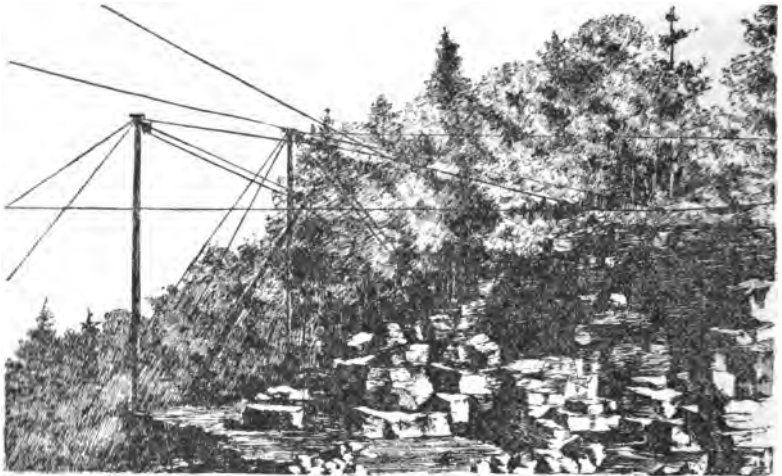
Following the measures in an ascending order the escarpment is met with next. This escarpment, which faces the north and presents its bold front to the Ottawa Valley at the quarries, belongs to the Black River and Trenton formations, or to the Trenton group as it is sometimes called.

The two formations pass imperceptibly from one into the other, only an arbitrary line can be drawn to separate them. The lower part of the escarpment at the quarries belongs to the Black River formation, whilst the upper portion is distinctly Trenton in *facies*. It was in the lower half at the level of the tramway and track, some 15 feet higher than the swamp facing the quarry, that the proprietor, Mr. Archie Stewart found a large coral mass, which he brought to the museum of the Geological Survey for identification. It proved to be the typical coral, *Columnaria Halli*, Nicholson. At a higher elevation, some fifty feet above the *Columnaria* horizon, masses of *Tetradium fibratum*, Safford, were found, which are considered characteristic Black River forms also, yet these were immediately followed by large colonies of *Prasopora Selwyni*, Nicholson, associated with orthoceratites and brachiopoda, of typical Trenton aspect.

The beds throughout the section proved to be highly fossiliferous, but especially so were those in the highest and thin-bedded portions of the escarpment. The beds were seen to vary in thickness, but

the heavier beds and more compact ones occupied the lower portion of the outcrop.

The following view of the quarry reproduced from a pen and ink sketch by Miss A. M. Living, of our club, gives a good general idea of the upper portion of the quarry, with some of the large blocks of quarried limestone to be taken down to their destination, the Soulanges Canal.



Along the western extremity of the quarry, large blocks of quarried and dressed limestone had been piled up and were examined, showing the character of the limestone, thickness of the beds and mode of occurrence. It was evident that a quarry similar to those of central Ontario, from which the material was obtained for the construction of the Trent Valley Canal, had been opened at Rockland, and that the rock was of superior quality. Some of the upper beds of the quarry were apparently more easily shattered, but the hard compact and heavy bedded strata of the lower two-thirds will no doubt afford excellent blocks for the canal.

Through the kindness and courtesy of Mr. Stewart, the writer has been furnished with information on the character of the limestones of the new Rockland quarries. The result of examinations and tests

made of the rock are herewith given, and refer to the chemical composition, to the crushing strength of the stone, and to the microscopical characters of the same, besides a note on the absorption of moisture by the same limestone.

1 and 2.—*Chemical composition and ratio of absorption*, determined by Dr. B. J. Harrington, of McGill Collège, Montreal.

CERTIFICATE OF DR. B. J. HARRINGTON.

"The specific gravity of the stone was found to be 2.704, and the weight of a cubic foot deduced from these figures 168.5 lbs. (1 cubic foot of water being taken at 62.321 lbs). The analysis shows the stone to consist almost entirely of calcium carbonate, with a little insoluble matter and small quantities of the carbonates of magnesium and of iron. The exact figures are as follows :

Insoluble (including a little organic matter).....	2.75
Calcium carbonate.....	94.70
Magnesium " .....	2.37
Ferrous.....	0.18
	<hr/>
	100.00 "

As to the ratio of absorption of water by the limestone from Rockland, the following is an extract from a letter by Dr. Harrington dated 28th April, 1893 :

"The absorption of your specimen of limestone was almost *nil*. The exact figures were 0.03 of a part of water absorbed by 100 parts by weight of the stone. That is an absorption ratio of  $\frac{1}{3333}$ ."

(Signed.) B. J. HARRINGTON.

McGill College, 31st March, 1893.

3. *Macroscopic and Microscopic Examination of the Rockland limestone, by Prof. A. P. Coleman, of the School of Practical Science, Toronto.*

The following is the text of a report by Dr. Coleman, of Toronto, entitled : "Examination of Building Stone for Mr. Archibald Stewart, Ottawa. The specimen sent for examination is a cube of dark grey bituminous limestone from a quarry at Rockland, Ontario. Microscopically the stone is compact in texture with included crystals of

calcite and a few fossils, chiefly fragments of brachiopods. A thin section examined with the microscope shows a compact ground mass of calcite with enclosed crystals of the same mineral, some obscure fossil forms (bryozoa, brachiopod shells or crinoids), and some brown lines of bituminous matter.

Judged as a building material the specimen has all the characteristics of a durable stone. The dark-grey color will probably bleach to a lighter grey on exposure to the weather."

(Signed.) A. P. COLEMAN, PH. D.,  
Prof. Metall. and Assaying.

School of Practical Science, Toronto, March 27th, 1893.

4. *Crushing strength per square inch determined by Prof. H. T. Bovey, M. A., LL.D., of the Physical Laboratories, McGill College.*

The following is an extract from a letter by Prof. Henry T. Bovey on two specimens of limestone from the Rockland quarries:—

*Specimen A.* Dimensions 2" x 2.02" x 2.01".

Tested on bed.

Total crushing strength..... 92,000 lbs.

Crushing strength per square inch..... 22,772 "

*Specimen B.* Dimensions 2.01" x 2.025" x 2.01".

Tested on edge.

Total crushing strength..... 60,000 lbs.

Crushing strength per square inch..... 14,741 "

Weight of stone as per sample A = 168.11 pounds per cubic foot.

(Signed.) HENRY T. BOVEY.

McGill College, Montreal, March 22nd, 1893.

It will thus appear from the combined results of the tests made both at the Toronto and Montreal laboratories, that the stone from the Rockland quarries is of a superior quality. When compared with the results obtained from similar severe tests of limestones of Canada and the United States—those of the Rockland limestone stand high. For the record of such tests, the reports published by the State Surveys of New York, Pennsylvania and Minnesota—besides many other valuable contributions contain the most extensive and comprehensive remarks.

## FOSSIL REMAINS.

As it was remarked, before, the rocks of the quarry were very fossiliferous. On the occasion of the excursion of the O. F. N. C. quite a number of interesting forms were collected and the following succession of zones was noticed in the rocks forming the escarpment of the quarry in descending order.

- (1) Zone of *Leptana sericea*, Sowerby.
- (2) Zone of *Streptelasma corniculum*, Hall.
- (3) Zone of *Prasopora Selwyni*, Nicholson.
- (4) Zone of *Endoceras proteiforme*, Hall.
- (5) Zone of *Tetradium fibratum*, Safford.
- (6) Zone of *Columnaria Halli*, Nicholson.

No less than sixteen species of fossils were collected at the quarries as follows :—

1. Crinoidal fragments.
2. *Tetradium fibratum*, Safford.
3. *Columnaria Halli*, Nicholson.
4. *Streptelasma corniculum*, Hall.
5. *Prasopora Selwyni*, Nicholson.
6. ?*Homotrypa similis*, Foord.
7. *Stictopora acuta*, Hall.
8. *Serpulites dissolutus*, Billings.
9. *Rafinesquina alternata*, Conrad.
10. *Orthis testudinaria*, Dalman.
11. " *tricenaria*, Conrad.
12. *Ctenodonta* sp. indt. cf. *C. abrupta*, B.
13. *Orthoceras* sp.
14. *Asaphus platycephalus*, Stokes.
15. *Endoceras proteiforme*, Hall.
16. *Calymene senaria*, Conrad.

Most of these were collected by the writer, determined by himself; they represent a part of the fauna entombed in the rocks which occupy the face of the quarry. The horizon here is precisely the same as that at Wright's new quarries, Hull, near the C. P. R. station of that town.

Just previous to leaving the field, Dr. R. W. Ells, ex-president of our club, visited Rockland and the quarries adjoining. When at Clarence Creek, one and a half miles below Rockland, Ont., he made quite an extensive collection of fossils which the writer has examined only cursorily and the following forms are included in it :—

*Fossils Collected by Dr. R. W. Ells at Clarence Creek, near Rockland, Ont., Sept., 1893.*

1. Crinoidal fragments.
2. Stictopora acuta, Hall.
3. Prasopora Selwyni, Nicholson.
4. ? Monotrypella sp.
5. Discina or Trematis sp.
6. Crania sp. cf. C. sp.
7. Lingula quadrata, Eichwald.
8. Leptæna sericea, Sowerby.
9. Rafinesquina alternata, Conrad.
10. Streptorhynchus filitextum, Hall.
11. Orthistestudinarina, Dalman.
12. " pectinella, Conrad.
13. " sp. (? N. sp.)
14. " vel Anazyga sp.
15. Platystrophia bifurcata, v. lynx, Eich.
16. Bellerophon sulcatus, Emmons.
17. Rhynchonella increbescens, Hall.
18. Calymene senaria, Conrad.
19. Cheirurus pleurexanthemus, Green.
20. Dalmanites callicephalus, Green.
21. Illæus sp (cf. I. Milleri or Trentonensis.)
22. Asaphus platycephalus, Stokes.
23. " megistos, Locke.
24. Trinucleus concentricus, Eaton.

Of these Nos. 5, 6, 7, 16, and 24 are of more than ordinary interest, especially the last form Trinucleus concentricus, Eaton, a small trilobite which is very common in the Trenton of Montreal and Montmorency,

but which has not, as far as I am aware, been recorded from the Ottawa district as yet.

From the foregoing remarks it is hoped that such general characters of the rock formations of Rockland can be gathered as will be of service to those interested in the quarry as well as others. The beds of the Lower Trenton—and those of the Black River formation almost everywhere in Eastern Canada—have been used as building material, whether for piers, bridges or canals, and proved highly satisfactory.

The Trent Valley Canal locks, as above stated, the piers for the Victoria Tubular bridge, the locks and improvements on the Lièvre River, and the locks on the Rideau Canal at Ottawa, have all been constructed with stone from the Trenton and Black River formations.

In the case of the Rideau Canal at Ottawa, the limestones constituting the upper half of the Trenton formation here are too nodular and concretionary for canal purposes, and if only blocks from the lower half had been used it would have saved the department thousands of dollars that were subsequently spent in repairs.

In conclusion, the writer begs to thank Mr. Archibald Stewart for this opportunity of examining the geological features at the quarry under such favorable auspices, also for the information as to tests and reports of results made by the gentleman above quoted.

#### BOOK NOTICES.

The Butterflies of North America. Third series, Part xiv, by W. H. Edwards.

The last part of Mr. Edward's magnificent work has been received. It is a most interesting number and will be read with interest by all Canadian Lepidopterists. The three plates are particularly fine. No. 1 shows *Neominois Ridingsii* in all its styles. This is a Coloradan species flying at high elevations. No 2 illustrates *Chionobas Aeno* and its variation var. *Assimilis* in which the band on the underside of the secondaries is wanting or scarcely showing. Both the type and the variety fly together in Labrador and on the highest summits of the mountains of Colorado.

Plate 3 is of special interest to the members of our Club as it shows the fine species, *Ch. Macounii*, discovered by our indefatigable

member, Prof. John Macoun, and named after him by Mr. Edwards. The first specimens were caught at Nepigon on 28th June, 1884. It is a rare and short-lived insect and few specimens are known in collections. The only other known locality where specimens have been taken is Morley, at the eastern base of the Rocky Mountains, and here again strangely enough Prof. Macoun was the lucky captor. He took but 3 specimens, 2 males and a female, and no other collector has since found it there.

The number of collectors who have been to Nepigon to get *Chionobas Macounii* have given it a local celebrity, and the possibility of an entomologist being a rational and sane being is there allowed. The butterfly is there known as the "One-eyed Butterfly" from the fact that when at rest one of the large ocelli or eye-like spots beneath the upper wings is very conspicuous. This name, however, has given rise to most remarkable tales amongst the residents, and Indians. Most of these take the shape of descriptions of a wonderful insect with one large eye in front of its head. As few collectors, however, have obtained the butterfly, it is locally reported to be of fabulous value, "\$100 a specimen," being a convenient sum to mention, that is the usual figure quoted as its value. Guided by the local descriptions of the "One-eyed Butterfly," I fear that would-be speculators would be a long time making their fortunes.

The letterpress of this part of Mr. Edward's work is very full and interesting, and on the whole it will probably be considered one of the best that has appeared.—J. F.

Catalogue of the Lepidopterous Super-family Noctuidæ found in Boreal America. John B. Smith, D. Sc., pp. 224, 8 vo., Washington, 1893. (Bulletin 44 U. S. National Museum.)

Under the above modest title a most valuable work has lately been issued. It is not simply a list of species, but a complete bibliographical and synonymical catalogue, prepared by Dr. Smith with great labour during many years of special study.

A full preface explains the origin and purpose of the work, as well as some of the difficulties which it was necessary to overcome in its execution. There is a list of the authors and works cited, and an excellent index.

The author, date and original place of publication are given for every genus and species. Great care has been taken by the writer to examine, where possible, the types, and indication is given where these may be found. Published references are cited separately under the name of the species and the synonyms. Under the head of Habitat, Dr. Smith gives the distribution as far as known to him. Most references, however, to the 3,456,542 square miles of territory which are officially recognized as the Dominion of Canada (exclusive of Labrador and Newfoundland) are covered by the one word "Canada." This shows that few of our Canadian collectors have availed themselves of the generous offer made by Dr. Smith as advertised in all the Entomological Magazines, namely, that "he will name and return all material of this family sent to him, for the privilege of retaining such specimens as may be needed for description or for completing the collection of the United States National Museum."

As the author of the Catalogue has in preparation a Monograph of the whole of this family of moths, it is to be hoped that Canadian Entomologists will do all they can to assist him by sending him liberal supplies of material. The tendency of some to lock up in private collections rare and interesting specimens is much to be regretted. It is far better to send them to a specialist for study and subsequent deposition in a public museum where they will be not only of scientific value, but also available for study by others, and will have much greater chance of being preserved. The personal possession of rare or even unique specimens is after all a very small pleasure compared with that of knowing that they are in a place where they can be of use to many, and where the best care will be taken of them.

The large number of species included in the Noctuidæ, the close similarity between many of these, and on the other hand the wide variations which sometimes occur in the different specimens even of the same brood, make the study of this family very difficult. For this reason Dr. Smith's Catalogue will be gladly welcomed by Lepidopterists. It is a wonderful book and throws a flood of light on what was a hopeless chaos of impenetrable disorder.—J. F.

## PROGRAMME.

1893—OTTAWA FIELD-NATURALISTS' CLUB—1894.

LECTURES AT 8 P.M. IN NORMAL SCHOOL, OTTAWA.

Dec. 12th.—Inaugural Address: The extinct Northern Sea-cow and  
early Russian Explorations in the North Pacific.

Dr. G. M. Dawson, C.M.G., F.R.S.

Jan. 9th.—Following a Planet. (*With lantern illustrations*)

A. McGill, B.A., B.Sc.

Jan. 23rd.—Biological Water Analysis. (*With lantern illustrations.*)

Dr. Wyatt Johnston, Montreal.

Feb. 6th.—How Rocks are Studied.

Frank Adams, Ph.D., (McGill College, Montreal.)

Feb. 26th.—The Transmutations of Nitrogen. (*With chemical ex-  
periments.*)..... Thos. Macfarlane, F.R.S.C.

Mch. 6th.—Ottawa Butterflies..... James Fletcher, F.R.S.C.

Notes on the Natural History of the Islands of Behring  
Sea..... James H. Macoun.

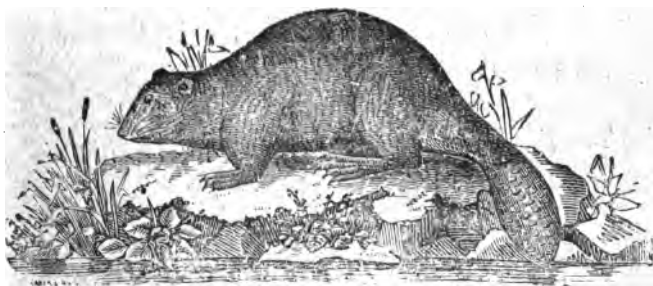
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Mch. 20th. Annual Meeting at 4 p.m.

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January, 1894.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 10.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued January 16th, 1894.

Published Monthly at \$1.00 per annum.

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## THE EXTINCT NORTHERN SEA-COW, AND EARLY RUSSIAN EXPLORATIONS IN THE NORTH PACIFIC.

By DR. GEORGE M. DAWSON, C.M.G., F.R.S., etc.

One object of the meetings of this club, is that of enabling its members and their friends to bring before the Society for explanation and discussion, subjects which they have been engaged in studying, or which may have come under their notice. Thus it has occurred to me that it may interest you, as naturalists, to review the main facts relating to the now extinct Manatee or Sea-Cow of the North Pacific. The collection of these facts has interested me particularly because, in 1891, I had an opportunity of visiting the former resorts of the animal and of procuring there a number of its bones. This animal is one of these—forming a very short list in all—which have disappeared completely within historic times.

The connection established in the title of my paper between the sea-cow and the early Russian explorations in the North Pacific, may appear to require explanation, but this explanation is found in the circumstance that the extermination of the animal chiefly resulted from these explorations, and in the fact that if left to itself, the sea-cow,—though evidently in its decadence—would in all probability be still reckoned as a member of the living world.

Everyone here must be familiar with the fact that a principle motive in the exploration and occupation of the northern part of North America was the trade in furs. Missionary enterprises may have actuated many of the early explorers, but some even of the missionaries, were not averse to profitable barter; while in the case of the great fur companies, this was the object of their existence. The Hudson's Bay Company was early in the field, and after the conquest of Canada the Montreal North-West Company superseded the older French trading companies, and first in competition with, afterwards in combination with the Hudson's Bay Company, pushed its trading posts and stations westward to the Pacific Ocean.

Furs and pelts of many kinds were obtained by these traders, but, throughout, the skin of the beaver may be stated to have been their

main pursuit, as it became their standard of value. In a manner precisely similar, the northern part of Asia was overrun by traders moving in an easterly direction. The Russian expeditions of conquest followed in the wake of the Russian fur-traders, and about the beginning of the last century, the Russians began to establish themselves on the shores of the Pacific Ocean.

For the Siberian merchants, the chief quest was that of the sable, and thus it is that the occupation of Siberia has been described as one gigantic sable hunt, beginning at the Ural Mountains and extending to the Eastern Ocean. This ocean—the Pacific—was reached by the valley of the Anadyr River, far to the north, and at Okotsk, on the sea of the same name. Between these places lay the remarkable volcanic peninsular of Kamtschatka. About 1696 its conquest began, and in some fifteen years it had been throughout rendered tributary to Russia ; but the great ocean to the eastward, and what it might contain, still remained unknown.

The enormous extension which the Russian Empire had achieved in Asia, naturally attracted the special attention of its ruler, and in the last year of her reign, Peter the Great planned an expedition of explorations from the eastern Asiatic coast toward America. Before the expedition could be despatched the Czar died, but his consort, the Empress Catherine, anxious in all respects to carry out the wishes of her late husband, caused the preparations to be continued, and in 1725 Vitus Behring was despatched on this mission, in conformity with the original intention of the Emperor. Behring was a Dane, engaged in the Russian service. He left St. Petersburg provided with a corps of assistants and all the facilities which the government could furnish, to cross Siberia to Okotsk, which was to be his port of departure for the exploration of the unknown North Pacific.

It is unnecessary to follow his various journeys and the many delays which he experienced, nor is it relevant to the present subject to trace his first expedition from Okotsk by sea, in which he outlined the northern part of Asia toward Behring Straits. His celebrated voyage to the American continent, with which we are chiefly concerned, was not executed till the year 1741, when he left the Bay of Avacha, in

Kamtschatka, with two little vessels which had been built ; one specially under his own command, the other under the command of his lieutenant, Chirikof. The two vessels shortly became separated, but in the end both captains sighted what is now known to have been the American continent.

Chirikof regained Kamtschatka before winter, but Behring and his ship's company of 70 men or more were less fortunate. The part of the coast seen by Behring was near Mount St. Elias, where his people landed on an island, now known as Kaye Island. Little time was given to exploration, for, having delayed long in searching to the south-eastward of Kamtschatka for a mythical land existing only on the maps of the day, the scarcity of provisions on board his ship began to weigh upon the commander. After taking on board some water, and without even meeting any of the inhabitants, sail was again made for the Asiatic coast. It was already past the middle of July, fogs and storms delayed the navigators, and in endeavoring to make a westerly course they encountered the great southward-bending chain of the Aleutian Islands. Short stoppages were made at several of these Islands, which it is now difficult to identify exactly, but in the end they passed clear of this archipelago and found themselves again steering westward across a trackless sea. The conditions were becoming desperate. Water was scarce and food was issued at reduced rations, while the crew were all more or less afflicted by scurvy. The commander himself had taken to his bed, and it is related that the two men necessary for the helm were led thither by two others scarcely in better condition than themselves.

Land was at length sighted, and it was assumed to be some part of the peninsula of Kamtschatka. All the difficulties of the return appeared to have passed, and for a brief period it was a time of congratulation and general joy. The vessel was already in a deplorable condition, and at a council of the officers it was decided that it would be necessary to land on the shores in sight whatever they might prove to be. The vessel was brought to an anchor, but before the landing could be effected in any regular way, a storm sprang up in which she was cast ashore, and though none of the crew were drowned, several of those already sick succumbed to the effects of the scurvy in the process of landing.

The distressed crew were once more ashore, but as castaways on an unknown land. They finally arrived at the conclusion that it was an unpeopled region, for the only animals at first seen were foxes, and these showed a complete fearlessness of man, of such a kind as to indicate that they had never before come in contact with him. There was no wood but driftwood on the island—for such it proved to be—and that was scanty. Thus, in order to shelter themselves from the inclemency of the weather, the survivors were reduced to digging holes in the sand, which they covered with sails.

So the winter was spent, and more men died, among them Behring himself. The island which they had reached was that since known as Behring Island, situated some 90 or 100 miles from the Kamtschatkan coast to which they had hoped to return.

Adapting themselves as well as they could to the circumstances, the crew found that the sea-otter which frequented the island afforded a source of food. During the winter a whale was also washed ashore which materially assisted in their sustenance; but before the end of their stay, it was discovered that the sea-cow, which frequented the shores in herds, afforded a much more toothsome and wholesome flesh than that of any of the other animals. A method of hunting the sea-cow was established, and it is largely to the existence of this animal that the ultimate salvation of a part of Behring's crew was due.

This brings us to the main subject of my paper, the sea-cow or manatee of the North Pacific; but before speaking further of the sea-cow itself, it will be in order to state that in the following summer—that of 1742—a new but much smaller vessel was constructed from the wreck of the original one, in which, setting sail in August, the survivors managed in ten days to return to Avacha Bay in Kamtschatka.

With them they brought some trophies from the newly discovered lands; amongst these the skins of the sea-otter, or sea-beaver as it was called by the Russians at the time; the pursuit of which was the moving cause of the numerous Russian expeditions of following years. A new avenue for the enterprise of the fur-traders had been opened up and skins even more valuable than those of the sable allured them to

embark on hazardous adventures among the islands of the Eastern Sea.

The sea-cow, which was thus in its last retreat accidentally discovered, is an animal possessed of the greatest interest to the zoologist. Nearly all we know now of its habits and appearances is derived from the descriptions of Steller, a naturalist who accompanied Behring's expedition, and who, though he shared to the full in its hardships and distress, still found time to note and write out his observations on the natural history of the new lands discovered. Muller, quoting from Steller's notes, writes :—

“I return to my design, to show how useful the Manati was to our ship's company with regard to their sustenance. Some of these animals have been caught, which from the snout to the point of the tail were from three to four fathoms long, and weighed 200 pouds, or 8,000 pounds. One was food enough to serve for a fortnight, and the flesh was very savoury like the best beef; that of the young ones was like veal. And the sick found themselves considerably better, when; instead of the hard beaver's [sea-otter's] flesh, they eat of the Manati, though it cost them more trouble to catch than one of the beavers. They never came on the land, but only approached the coast to eat sea-grass, which grows on the shore, or is thrown out by the sea. This good food may, perhaps, contribute a great deal to give the flesh a more agreeable taste than that of the other animals that live on fish. The young ones that weighed 1,200 pounds and upwards, remained sometimes at low water on the dry land between the rocks, which afforded a fine opportunity for killing them, but the old ones could be caught not otherwise than with harpoons, fixed to long ropes. Sometimes the ropes were broke, and the animal escaped before it could be struck a second time. This animal was seen as well in the winter as in the summer time. They melted some of the fat, with which, like hogs, they are covered from three to four inches thick, and used it as butter. Of the flesh, several casks full were pickled for ship's provision, which did excellent service on their return.” \*

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\* *Voyages from Asia to America*, Muller. Jeffery's translation, pp. 61-62.

Steller recognized the similarity of the sea-cow of the North Pacific to certain other animals already known ; but, being possessed of imperfect information, he assumed that all these belonged to a single species. We now know that this was an erroneous conclusion, that this sea-cow was specifically and generically distinct from others of the group, and it is consequently very often known as Steller's sea-cow.

The sea-cows in fact form a peculiar group of the mammalia, which is now classed as a separate order and which shows little affinity to any other mammals, for though in its aquatic habits and in some other respects it resembles the whales and porpoises it is very different from these in anatomical structure. This is probably a very ancient group, for fossil remains referable to it are found in several geological formations in Europe, Africa and America ; but in human times it appears to have dwindled, and to be verging on extinction from natural causes altogether apart from any specific attacks by man.

Within the historic period, this whole order of mammals has had but three living genera.—The Manatee proper, which inhabits the shores and estuaries of the Atlantic within the tropics. The Halicore or Dugong, found in the Red Sea, on the East Coast of Africa and in the Indian Seas as far east as Australia ; and the Rhytina, of which but one species (*R. Stelleri*) appears to have existed. The last-mentioned is the sea-cow here specially referred to, that of the North Pacific.

It is very often the case, that ancient types of animals which have already played their part in the history of the world, are found in the last stages surviving in a few forms widely separated geographically. It is so in the present instance. The Halicore is separated by the length of the African continent from the Manatee of the Atlantic, while Steller's sea-cow was discovered, as we have seen, on a remote island of the North Pacific.

Early navigators had observed the Halicore and Manatee as animals of a strange and problematical character, and it is supposed that the habit of these animals in carrying the young under the fore limb may have given origin to the fabled mermaid. Thus when systematic names began to be applied by naturalists, those animals belonging to this order were designated *Sirenia*.

In this order the hind limbs are entirely wanting and the tail is expanded to a wide fin, like that of the whale. All its representatives which have come under the observation of man, appear to be slow, and unintelligent, if not actually stupid. They are herbivorous, living on marine algæ, or on aquatic plants growing in the estuaries of rivers. They are without means of defense, unable to escape easily by superior speed in the water, and incapable of locomotion ashore. More than this, in their search for food, they are frequently left stranded by the outgoing tide, when they are entirely helpless; while the flesh is always good for food, the fat produces an excellent oil and the skins are useful because of their thickness and strength. The inducements for their pursuit by man are thus very great.

Both the Manatee proper and the Halicore are provided with teeth, the now extinct *Rhytina* was toothless, the place of teeth being supplied by bony plates upon the jaws which served for the mastication of its soft food.

The discovery of the sea-cow and its utilization for food by Behring's crew have already been referred to. The short story of its extermination must now be told.

No sooner had the survivors of Behring's crew returned with specimens of rich furs, particularly that of the sea-otter, than Siberian traders began to build small vessels to revisit the new islands which had been discovered. These were no well equipped expeditions, for means and materials of all sorts were scarce and very primitive on the shores of the Sea of Okotsk. The craft employed at first were small and ill-constructed. Coxe writes of them:—"Most of the vessels which are equipped for these expeditions are two-masted; and commonly built without iron, and in general so badly constructed, that it is wonderful how they can weather so stormy a sea. They are called in Russian *Shitiki*, or sewed vessels, because the planks are sewed together with thongs of leather." \*

In such crazy vessels the Russians by degrees extended their wanderings till the whole of the islands of the great Aleutian chain

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\* Account of the Russian Discoveries between Asia and America. p. 9.

became familiar to them. The adventurers were often absent for several years on a single cruise, wintering at some island and eventually, when in luck, returning with their accumulated furs to Kamtschatka or to Okotsk. Very frequently they were shipwrecked, and not one but several cases are known in which, like Behring's crew, the shipwrecked men reconstructed a vessel from the poor debris of that which had been cast away and in it returned to the Siberian coast. But whole crews often sailed never to be heard of again, or to be heard of only by subsequent voyagers as having been massacred by the natives.

The adventurers were both hunters and traders. They engaged themselves in the capture of sea-otters, foxes and other valuable skins and besides obtained them by barter from the natives. Under the guise of rendering these people subsidiary to Russia, they also exacted a tribute of furs from them ; taking as much as they could and giving in return merely a paper receipt to the effect that tribute had been paid for the current year.

Coxe briefly describes the method of trade as follows:—"The Russians have for some years past been accustomed to repair to these islands, [the Aleutians,] in quest of furs, of which they have imposed a tax on the inhabitants. The manner of carrying on this trade is as follows. The Russians go in autumn to Behring's island and there winter ; they then employ themselves in catching the sea-cat, and afterwards the Seivutch, or Sea-lion. The flesh of the otter is prepared for food and is esteemed very delicate. They carry the skins of these animals to the Eastern islands. Next summer they sail eastward to the Fox Islands ; and again lay their ships up for the winter. They then endeavor to procure, either by persuasion or force, the children of the inhabitants, particularly of the Tookoos, as hostages. This being accomplished, they deliver to the inhabitants fox-traps, and also skins for their boats, for which they expect in return furs and provisions during the winter. After obtaining from them a certain quantity of furs, by way of tax, for which they give quittances ; the Russians pay for the rest in beads, false pearls, goats wool, copper kettles, hatchets, etc. In the spring they get back their traps, and deliver up their hostages. They

dare not hunt alone, nor in small numbers, on account of the hatred of the natives." \*

The whole story is a very painful one and most of it has lapsed beyond the possibility of recovery. The Russian traders were scarcely less barbarous than the Aleuts whom they eventually subdued and reduced into a scarcely disguised slavery. They were, however, provided with firearms, while the natives had, whether for defence or for attack, only spears, darts, and such like primitive weapons. We have imperfect accounts from the Russian point of view of these transactions, but none from that of the natives who were the principal sufferers. We gather and with difficulty, only the fact that the Aleutian Islands were originally occupied by a numerous population, which before many years had become reduced by slaughter and by disease, introduced by the conquerors, to very scanty proportions.

The Aleut race was decimated, but the fur trade continued, and has continued in one form or another up to the present day. Meanwhile the sea-cow became extinct, and it is to this fact particularly that I now wish to draw attention.

It soon became habitual for the Russian traders to resort in the first instance to Behring Island in order to lay up a supply of salted meat for the farther voyage to the Aleutian Islands. The good qualities of the flesh of the sea-cow rendered it the chief object of pursuit for this purpose, and thus it happened that this nearly defenceless animal was constantly sought after and hunted. We have already seen that its range was very limited. Within historic times it appears to have been practically confined to the Commander Islands—Behring and Copper Islands.—Tradition speaks of the occurrence of the animal on the Kamtschatkan coast, and investigators have found reason to believe that it at one time frequented also the northern islands of Japan and the northern coasts of China. Its bones have been found on Attu Island, the furthest west of the Aleutian archipelago, but it is not certain that these may not represent merely carcasses which have been washed ashore there. From the accounts of Steller, it would appear

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\**op. Cit.* pp. 220—221.

that it was already maintaining itself with difficulty in its last unmolested retreat. The winter there was severe, and at that season the sea-cow became so thin that every bone was clearly visible. It appears by nature to have been intended for some less rigorous climate, but from all such places it had already been driven by man and other predaceous animals. Thus it proved easy to extinguish the survivors of this interesting and ancient but nearly effete race, and without any intention or knowledge of what they were about, this extinction was accomplished by the ignorant Russian traders.

In 1755, Jakovlev, a mining engineer who was sent to report on the occurrence of copper on Copper Island, noted that the sea-cow had already disappeared from that island, and according to the best information, the last of the race was killed on Behring Island. (which from the first knowledge had been its chief haunt) about the year 1768. Nordenskjold who visited Behring island in 1879, thought he had ascertained from enquiry among the Aleut people there that a single specimen of the sea-cow was seen on the coast as lately as 1854,\* but Stejnejer, who visited the island more recently and who re-examined the same men with whom Nordenskjold had spoken, has shown that this was probably a mistake. †

Thus it happens, that at the present day Steller's sea-cow, instead of browsing still upon the kelp along the shores of Behring Island, is known to science only by its bones. When Nordenskjold visited the island he made a special search for remains of the sea-cow and found that the bones were occasionally discovered by the natives along the shores, generally in a low sandy tract slightly above the present high-water mark. By prodding in this sandy ground with iron instruments the presence of the buried bones might be detected, and in this way he secured enough to make up a nearly complete skeleton. Since that time other skeletons have been collected and a certain number of detached skulls, and there can be no doubt that more will be found from time to time.

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\*Voyage of the Vega. English Ed. Vol. II. pp. 272-270.

† Proc. U.S. Nat. Mus. Vol. VII. (1884) p. 181. American Naturalist Vol. XXI. p. 1047. Am. Geographical Soc. Bulletin, No. 4. 1886.

The history disclosed by geological research, apart from its purely physical aspects, is that of the progress of life upon the globe; the extinction of species after species of plants and animals and the introduction of new forms in their place. It is by means of the now ascertained stages of this process of change and replacement that the geologist is enabled to determine the age of any particular fossiliferous series of rocks which may come under his notice. But the scale of geological time is a very extended one, as compared with the progress of human events, and the number of animals which have been actually known to man and have since succumbed to process of change is very small. In almost every known case of the kind, man himself has assisted in giving the *coup de grace* and in completing the extermination of some animal which by reason of natural causes had already become very much restricted in its habitat.

This, as we have seen, was the case with the sea-cow. Its hour had very nearly struck before the appearance of man upon the scene.

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### A PLANORBIS NEW TO THE OTTAWA LIST.

By GEO. W. TAYLOR, VICTORIA, B.C.

While paying a short visit to Ottawa in September last, I was so fortunate as to discover about 40 specimens of a freshwater shell new to the local lists.

The species in question is *Planorbis nautilens* Linn, and the specimens, which are all of the variety *cristatus*, were found in the ponds on the right of the road as you pass the St. Louis Dam on the way to the Experimental Farm. The only other American specimens I have seen of this species (which by the way is common enough in the old country) are two that were found by the indefatigable Mr. Hanham in the neighbourhood of Hamilton.

It would be interesting to know how this species has been introduced at Ottawa, as introduced it must have been quite recently, for it could not have long existed undiscovered in a locality so well searched as the St. Louis' Ponds have been by the Ottawa Conchologists.

## HYMENOPTERA PHYTOPHAGA, 1893.

By W. HAGUE HARRINGTON.

Since the publication of my catalogue of the phytophagous hymenoptera of this locality, I have been able to examine the insects of this group which were captured by me last summer, and the annexed list will serve as a record of the season's work, and, at the same time, as a supplement to the previous paper. My collecting was restricted to the month of June and the first two weeks of August, and even during these periods the unusual number of wet days limited my outings considerably. Sawflies also seemed to be much less abundant than in some seasons, and several even of the commonest species were not observed. It will be seen that there are only 42 species in the list, or only about one half of the number recorded (*Canadian Entomologist*, vol. xxii, page 23) as captured here in 1889. Quite a number of the specimens were secured at the sub-excursions to the Mer Bleue and Casselman, and I find that at the latter place a specimen was taken which proves to be an addition to the published list, viz. *Monophadnus tilia*, which, as the name indicates, is known to occur upon the bass wood, in Canada and the United States, and of which the probable larvæ have been observed by me on the trees of this locality.

*Trichiosoma triangulum* Kirby.—1 female, Aug. 13, Race-course.

*Zarea inflata*, Norton.—1 female, July 31st. The occurrence of a second specimen confirms this species which was doubtfully placed in former list.

*Hylotoma McLeayi*, Leach.—2 females, July 29, Hull, goldenrod.

" *clavicornis*, Fabr.—1 female, June 3, Mer Bleue; 2 do, June 14; 1 do. July 30, Hull.

*Nematus subalbatus*, Norton?—1 female.

" *corniger*, Norton.—2 males, June 10; 1 female, July 29.

" *erythrogaster*, Norton.—1 female, June 7; 1 do. July 30, Hull.

" sp. near preceding.—1 female, June 6, Hull.

" *Erichsonii*, Hartig.—Several females in tamarackswamp beyond Casselman on June 10th, Larvæ less abundant in this district apparently than in former years.

*Nematus ribesii*, Scop.—Abundant as usual in gardens.

- Nematus mendicus*, Walsh.—1 female, June 14, Willow.
- Emphytus apertus*, Norton.—Females, June 1, 7, July 27, 30; male July 29.
- Emphytus canadensis*, Kirby.—1 female, June 1, Hull.
- “ *cinctus*, Linn.—5 females, 1 male, bred in July from larvæ feeding in June upon rosebush in garden.
- Dolerus aprilus*, Norton.—4 females, June 10, July 29; 1 male, June 18.
- “ *similis*, Norton.—1 female, June 10.
- Monophadnus bardus*, Say.—1 female, May 30, city.
- “ *medius*, Norton.—1 female, June 24; 1 male, June 10.
- “ *tiliæ*, Norton.—1 female, June 10, Casselman.
- Phymatocera fumipennis*, Norton.—3 females, June 7; 1 male, June 1.
- Monostegia rosæ*, Harris.—Common in June.
- Selandria flavipes*, Norton.—3 females, June 10.
- Alantus basilaris*, Say.—19 females, 5 males; July 29, Aug. 5.
- Macrophya albomaculata*, Norton.—1 female, June 8; Billings Bridge.
- “ *trisyllaba*, Norton.—11 females, 2 males; June 14, July 30.
- Pachyprotasis delta*, Prov.—1 male, June 7; Hull.
- Taxonus nigrisoma*, Norton.—2 females, 3 males; June 12.
- “ *dubitatus*, Norton.—2 females, June 12.
- Strongylogaster pallicoxus*, Prov.—1 female, June 8; 2 males June 1.
- “ *rufocinctus*, Norton.—1 female, June 24.
- “ *epicera*, Say.—1 male; June 1; Hull.
- “ *pallidicornis*, Norton.—1 male, June 17.
- “ *apicalis*, Say.—4 females, 1 male; June 14, 24.
- Poecilostoma albosecta*, Prov.—1 female, June 3; Mer Bleue.
- Tenthredo rufospectus*, Norton.—3 females, June 24.
- “ *ventralis*, Say.—1 female, July 30.
- “ *verticalis*, Say.—1 female, 1 male; June 24.
- Tenthredopsis 14 punctata*, Norton.—1 female, June 6.
- Monoctenus fulvus*, Norton.—2 females, 1 male. May 31 on ornamental cedars at Experimental Farm.
- Pamphilus pallimaculus*, Norton.—1 female, June 18.
- Oryssus Sayi*, Westwood.—1 female, June 17. Poplar.
- Xiphydria albicornis*, Harris.—1 female, June 17.
- Tremex columba*, Linn.—1 female, Aug. 5.

## ORNITHOLOGY.

Edited by A. G. KINGSTON.

Five specimens of *Uria lomvia*, Brünnick's Murre, were shot near Ottawa on 20th November last. Four of these were shot on the Ottawa river near Templeton, and the other at the St. Louis Dam. There were about twenty birds in this flock. I learn from Dr. Brodie that several were seen in Toronto Bay.

G. R. WHITE.

Mr. Wintle, of Montreal, also writes us that "large numbers of Brünnick's Murre have visited this neighborhood this fall, and as far up the Ottawa River as St. Andrews." He also says that a correspondent in Toronto speaks of having examined thirty specimens taken there. They have also been reported by Mr. MacIlraith as occurring in some number at Hamilton.

The family of the Murres and Auks are essentially birds of the sea-coast, the above and several kindred species breeding commonly on the rocky shores and islands of the Gulf of St. Lawrence. The sole previous record of any member of the family at Ottawa is that of a Puffin (*Fratercula arctica*) in 1881, and even on the Great Lakes they are only known as rare and straggling visitors. Their invasion of our inland waters in such force as the above reports show is a matter well worthy of note.

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BOOK NOTICE.

Monograph of the North American Proctotrypidæ; by William H. Ashmead.  
Bulletin of the U. S. National Museum, No. 45.

This volume of nearly 500 pages will rank with the most important that deal with the American Hymenoptera, and is an exhaustive and able monograph of a family previously but meagrely investigated on this continent. The systematic position of the family and its subdivisions have been carefully considered and the arrangement is very skillfully carried out, by means of excellent synoptic tables. To Ottawa Naturalists the work has a special interest as it records about seventy

species from this locality, of which fully fifty are described as new species. The Proctotrypids form a family of more than ordinary interest, because all the members of it are parasites. Many of them infest the eggs of various orders of insects, and thus destroy many injurious forms ; others live upon the larvæ of small diptera, etc., and one sub-family particularly infests certain small Homoptera. Notwithstanding the small size of these insects (many being very minute) they exhibit numerous and interesting modifications of structure, and afford in general good characters for the separation of the numerous genera. The American species now known, chiefly through the labours of Mr. Ashmead, are about six hundred in number, placed in about one hundred and fifty genera and grouped in ten sub-families. In Canada but little attention has been given to the collection of these minute forms and but few species are recorded other than those furnished by Ottawa. Many of the smaller species hibernate in moss and can most easily be secured by sifting such material obtained from swampy localities. A bag of moss obtained in Dow's Swamp on Thanksgiving Day, the sifting of which was completed recently, yielded quite a large number of specimens, including several of the very small *Bæus minutus*. It is our intention to prepare a list of the Ottawa species for a future issue. Mr. Ashmead has much enhanced the value of his magnificent work by eighteen plates in which the anatomy of typical species, and the various genera are illustrated by nearly one hundred and fifty beautifully drawn figures. The preparation of these plates and of the voluminous text have required skilful and patient labours which can be best appreciated by students who have themselves attempted the collection, classification and description of similar micro-organisms ; labours which have their reward chiefly in the assurance of more accurate knowledge acquired and distributed during the years of their faithful performance.—ED.

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#### EDITORIAL NOTES.

SOIRÉE NO. I.—On December 12th our talented President, Dr. Dawson, delivered a most interesting Inaugural Address, which we have the pleasure of presenting to our readers in this number. A valuable

collection of bones of the extinct sea-cow, gathered during his explorations, was shown and added much to give those present a just conception of the size of the animal.

SOIRÉE No. 2.—On January 9th the lecturer of the evening was Mr. A. McGill, whose address was entitled "Following a Planet." The subject was introduced in a very happy manner, and skillfully planned to give the listeners a clear idea of the position and movements of the heavenly bodies. Jupiter was the planet selected and his present place in the heavens and the course he takes through the starry vault were indicated by specially prepared charts. The whole lecture was fully illustrated by lantern views prepared by Mr. McGill and shown by Mr. Babbington.

SOIRÉE No. 3.—The next lecture will be by Dr. Wyatt Johnston, of Montreal, on "The Living Matter in Drinking Water" and cannot fail to be of great value and interest to every one. The health of any community is largely dependent on the purity of its water supply, and it is therefore of great importance to know what organisms or substances produce such conditions as render water unfit for consumption.

LIBRARIAN.—It is with great regret that the Council have to announce the departure of our Librarian, Mr. W. Scott, B.A., who has gone to Toronto, where he has accepted a position in the Normal School. During his terms as Librarian Mr. Scott gave much time and attention, not only to the reception and care of exchanges, but to the distribution of the OTTAWA NATURALIST. As an ardent student of botany and a zealous collector he will be much missed at our "outings," and as a capable and forcible speaker and teacher he will also be missed at our "innings." We wish him success in his new duties and hope that he may infuse some life and activity into the Naturalists of the Queen City. During the remainder of the current Club year the duties of Librarian will be assumed by Mr. Cowley who has kindly consented at the request of the Council to undertake them.

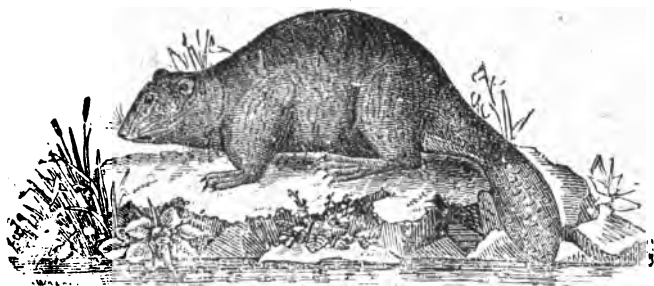
CORRECTION.—In the programme (page 150,) the date given for Mr. Macfarlane's lecture should read Feb. 20th, (instead of 26th.) Please change this date on the programme which you have placed in a conspicuous place, so that you and your friends may not be in doubt as to the day.

ANNUAL MEETING, MARCH 20th, 4.15 P.M.

February and March, 1894.

THE  
\* OTTAWA NATURALIST \*

VOLUME VII. No. 11 and 12.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued March 1st, 1894.

Published Monthly at \$1.00 per annum.

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uses. pp. 24, 10c.

## FOLLOWING A PLANET.

By A. MCGILL, B. SC., B.A.

(Read January 9th, 1894.)

It is by no means a difficult thing for anyone who will take the trouble to observe the heavens, say for half an hour each night on the consecutive clear nights of any month in the year, to assure himself that the stars which shine there maintain, with reference to each other, the same position in the sky, night after night. Perhaps the simplest and consequently the best observation to begin with, will be the recognition of the Great Dipper, not itself a complete constellation, but a very conspicuous group of seven stars in Ursa Major. So many people are familiar with the 'Dipper' that any one not himself able to identify it, will find no trouble in getting some friend to point it out for him—The stars are so arranged with reference to each other, that four of them are placed at the corners of a somewhat irregular rectangle—the bowl of the Dipper—while the remaining three extend outwards from one of the corners of the rectangle, nearly parallel to its long axis, and represent the handle. The middle one of these three is not exactly in line with the other two, so that the handle is slightly bent. It may be incidentally mentioned here that this particular star is double, and is a very beautiful object as seen by a small telescope. A very short distance above it is a somewhat smaller star, visible to the naked eye—and popularly known as *Jack*, astride of the pole of the cart, when, what I have called the *Dipper*, is imagined as *Charles' Wain*, a very common name in some parts of England, for this group of stars.

Nothing can be more instructive or convincing to a beginner in star-gazing, than the continuous watching through one whole night—preferably a summer night, in our latitude—of this star group. If this be done it will be found that when the long axis of the Dipper is parallel to the horizon, a position which it is certain to take some time during the period of vigil, then the handle will be extended to the left hand side (west) of the observer, if the Dipper is *right side up*; or to his right hand side, (eastward) if the Dipper is *upside down*. It is in this latter position that it will be seen at twelve o'clock these nights, (middle of

February.) As the hours pass it will be noticed that while the stars hold the fixed positions stated in regard to each other, the position of the group as a whole changes with reference to the horizon. Three hours after the handle was pointed eastwards, it will be found directed upwards, and three hours later will point westwards. If, at the times of noting the position of the Dipper, a more or less general observation of the brighter and more remarkable of the other star groups has been made, it will be an easy matter to convince oneself that every star in the sky has been describing a circle, larger or smaller westwards, the circles described being smaller and smaller towards the north—until the eye is compelled to notice one particular star, which alone, of all the bright stars in the sky, maintains a fixed position no matter how long the vigil be kept up. This star will be found in the very same place night after night throughout the year, as well as hour after hour for any particular night. It marks one of the polar points of an axis, about which the celestial sphere revolves, and it is the *pole star*. It may be easily seen that a line joining the stars in the *front* of the Dipper, if produced, will pass nearly through the position of the pole star, and hence these stars are often called the *pointers*.

It is necessary to any intelligent conception of the stellar movements, that the phenomena just described be fully apprehended; but it is to another set of star groups that I wish to-night to ask your attention. Thus far we are supposed to have been directing our eyes northward. Let us turn our backs as exactly as we can to the position of the pole star, and so placed, look upwards and forwards. We are looking in the plane of our meridian, and if we look directly up to the zenith, we locate in the line of vision, a point on the celestial meridian just as far from the pole star (in circular degrees) as our angular distance from the pole of the earth—which for Ottawa is practically the same as our latitude, about  $45^{\circ}$ .

Measure off as well as you can towards the South, and in the line of the meridian, a second distance equal to this, and you are looking at a point in the equinoctial or celestial equator. The stars at this point are seen to describe the largest circle in their movement from the eastern to the western horizon. A particular interest attaches to the making

of this observation at, or about, the 21st of March, and again at the 22nd of September. At these times you not only look at a point of the equinoctial, but at a point of the ecliptic, for at these dates the two circles cut each other, and in the interval the ecliptic or circle in the heavens which the Sun describes in his annual progress, passes north of the equinoctial, while from September to March the Sun's path is south of the equinoctial. Now, it will be evident on a moment's thought that since the stars cannot be seen while the Sun is in the sky, we need not hope to see the point of intersection of ecliptic and equinoctial, (except by looking at the Sun himself,) while the Sun is at that node. But, if we will look at our meridian as already described at midnight on the 21st March, we shall see there the place which the Sun will occupy on the 22nd of the following September; and if we choose that date in September for a similar observation, we shall see the so-called, *Vernal* equinox; and although no bright stars are situated at the region in question, a little careful scrutiny will enable us to fix in our memory a pretty numerous group of small stars—the constellation *Pisces*. Had the observation been made in March, we should have found a very brilliant star (*Spica*) in the constellation *Virgo* then in the meridian. This constellation marks the position of the Autumnal equinox, and the position of the Sun in September, from which date until March following, his path is south of the celestial equator.

Astronomers have marked off in twelve groups the stars lying along the Sun's path, and within a zone extending about 8 degrees on each side of the line of his motion. These so called zodiacal constellations are for the most part very easy of identification but I can scarcely recommend the two which mark the Equinoctial points as the first which should be located, although as I have already remarked, they possess a very special interest to the astronomer. They happen to be less well defined by brilliant stars than most of the others; and at this time of the year *Taurus*, *Gemini* and *Leo* are no doubt the most readily fixed in the memory. The small groups *Pleiades* and *Hyades* in *Taurus* can never be forgotten by any one who has once recognized them. While *Aldebaran* is a large red star forming one extremity of the V group known as *Hyades*. *Leo* is well marked by a sickle, in the handle of

which is the star Regulus, of the first magnitude. In summer nights the zodiacal constellations Scorpio and Sagittarius are very remarkable and beautiful. But perhaps the easiest way to note the position of the zodiacal constellations is to watch the progress of the Moon from night to night during any lunation. She describes, with sufficient accuracy for such purposes as this, the same path as the Sun, and in one thirteenth part of the Sun's period ; so that while the Sun takes about 30 days to pass from one of the zodiacal constellations to the next, the Moon covers the same space in little more than two days. If then the Moon's place in the zodiac be known when first she is seen (at the new), she will mark out the next constellation of the zodiac (eastwards) in about 55 hours from that time. Her brightness, especially at the full, makes it difficult to recognize the detail of the constellation in which she is situate ; but the constellations east and west of this one may be easily and satisfactorily examined.

Once the observer has made himself well acquainted with the belt in the heavens known as the zodiac, he will find no difficulty in assuring himself that the Moon is not the only celestial sphere which traverses this path. At different hours of the night and at different times of the year he will see the planets Jupiter, Saturn or Mars as very brilliant stars—differing only by the steadiness of their light from the other bright stars—in one or other part of the zodiac. At the present time Jupiter is the most brilliant star in the sky, and is in the constellation Taurus, a little south of the Pleiades. But Jupiter, Saturn and Mars may easily be distinguished from the true stars by the fact that they change their places with regard to these. It is on this account that they are named *Planets* (wanderers), and it is a peculiarity of their movement to which I would specially ask your attention to-night. Speaking broadly, any of these planets will be seen to travel over the same course as the Moon, that is from west to east, among the zodiacal constellations—but, of course, with much greater slowness. If we could view the Earth's motion in the zodiac from the Sun as our station of observation, (and though this cannot be done in fact, it may easily be done with the aid of imagination), we should see the Earth complete the circle from Virgo, in March, to Leo, in the following February ; in

other words the Earth requires twelve months to pass across the faces of the twelve zodiacal constellations as seen from the Sun. If now from our heliocentric position we watch the journey of Jupiter around the same course, we should have to wait 11.86 years to see the course completed,—or while the Earth passes from one constellation to the next in a month, Jupiter takes about a year to travel over the same arc. This is partly due to the fact that his orbital velocity in miles per unit of time is to that of the Earth as 4 to 9, and partly to the much greater length of his orbit, which is a circle having a radius about five times that of the Earth's orbital radius. But, although the rates of motion would be very different, the directions would be the same ; from Libra to Scpio ; from Scpio to Sagittarius, and so on eastward, just as in the case of the Moon. If now, still occupying the Sun's place, we were to watch the progress of both planets, it is evident that we should see the Earth make the complete circuit of the zodiac nearly twelve times while Jupiter made the journey once. And further, we should see the Earth pass Jupiter's place, say in Aries, in a particular year, while in the following year our planet would pass Jupiter in Taurus, and the next year in Gemini, and so on. Now Jupiter, as actually seen from the earth, does not journey regularly eastward, but appears, during a part of each year to retrograde, going from the east towards the west in the zodiac. The olden astronomy figured his path, as well as the paths of the other planets, as circles with loops on the circumference. These loops—or Epicycles—are twelve in the case of Jupiter ; and it is by no means difficult to understand how they explain the planet's peculiar and complicated motion, as seen from the earth. When, however, we adopt the Copernican theory which looks on the Sun as the centre of the planetary system, the explanation becomes still simpler. The best way to do this is to draw on a large sheet of paper two concentric circles of radii 1 and 5 respectively. These circles represent the orbits of our Earth and Jupiter, and their common centre is the Sun's place. Divide each circle into twelve equal arcs. The points of division will represent on the smaller circle the Earth's place at intervals of one month, and on the larger circle, Jupiter's place at intervals of one year. Subdivide any one of the arcs (of  $30^\circ$ ) of the larger circle into 12 divis-

ions, and each of them will represent Jupiter's place at monthly intervals. Starting with any one of the positions of the Earth as January, name the next one February, the next March, and so on, in the direction from right to left, or the reverse way that the hands of a clock travel over its face. Do the same for the monthly places of Jupiter, and finally connect by straight lines the points of the same name in the two circles. The point on the smaller circle represents the station of the observer for that month, and the point on the larger circle is Jupiter's actual place for the same month. The line joining these points is the line of vision, and if it be prolonged beyond the larger circle to a considerable distance—the farther the better—an arc may be drawn there which will represent a portion of the region of the stars, an arc of the ecliptic. On extending all the lines to this arc in the order of the months, it will be found that they intersect and retrograde exactly as does the planet when followed by actual observation in the heavens; and the more accurately that the diagram is drawn to scale, the more exactly will the figures explain Jupiter's actual motion. Nothing can be more interesting or more instructive to a beginner, than the combination of actual observation of the planet, with a geometrical plotting of the motions on paper in this way.

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#### NOTICE TO MEMBERS.

This number makes eleven issues of the *NATURALIST* and completes the Volume of 178 pages, besides the 24 pages of *Flora Ottawensis* issued during the year.

The *ANNUAL MEETING* will be held in the Normal School on Tuesday, March 20th, at 4 15 p.m. and in the interest of the Club a large attendance is desired. Those who have not paid their subscriptions for the year will kindly forward the same to the Treasurer without delay

## GEOLOGY.

Edited by H. M. AMI, M.A.

**THE GEOLOGICAL SOCIETY OF AMERICA.**—The fifth annual meeting of the Geological Society of America was held in Boston last December, 26th, 27th and 28th, under the auspices of the Boston Society of Natural History and of the Geological Department at Harvard University, Cambridge, Mass.

Principal Sir William Dawson, Emeritus Principal of McGill University, presided at the sessions for the greater part of the time, and was relieved by Prof. T. C. Chamberlain, of Chicago University, the new president-elect. Amongst the other Canadians present were: Mr. W. McInnes, Dr. F. D. Adams and Dr. H. M. Ami. Among the fellows recently elected are Messrs. T. C. Weston and E. D. Ingall, A.R.S.M., of the Geological Survey staff. A brief outline of the results of the meeting will be prepared for a future issue of the *NATURALIST*.

**MR. TYRRELL'S JOURNEY.**—Mr. J. B. Tyrrell, of the Geological Survey staff, has just returned from his extended trip to the Western Extremity of Chesterfield Inlet. During his journey, Mr. Tyrrell and his staff endured many hardships but finally reached Fort Churchill on the Western Coast of Hudson's Bay where they were hospitably treated. Thence the party travelled southward until Selkirk and the C.P.R. line was struck, arriving home in Ottawa the second week in January—having completed a circuitous route embracing some 4,600 miles. About 800 miles of that distance were by previously unexplored rivers, lakes and rocky land, the home of the barren ground caribou.

**MR. LOW'S TRIP TO UNGAVA BAY.**—News has reached the director and other officers of the Geological Survey from Mr. A. P. Low, B. A. Sc., who left Ottawa last April, 1883, and crossed the Labrador Peninsula to Ungava Bay. From thence Mr. Low crossed to Hamilton Inlet on the East Coast where he will winter. In the spring he will retrace his steps and return to Ottawa in the fall of this year.

## BOTANY.

Edited by W. SCOTT, B.A

*PELLÆA DENSA*, *Hooker*.—In looking over some ferns and plants collected by me on the Guelph Dolomites of Durham, County Grey, Ontario, in 1883, I chanced to observe a fern which had not hitherto been noticed by me with care and which turns out to be interesting. Having taken it to Prof. Macoun for identification, he immediately recognised the same to be a specimen of *Pellæa densa*, Hook.

This note is intended merely to place on record the discovery of this little "cliff-brake" in the Province of Ontario. I found it at Durham near the saw-mill dam on the Little Saugeen River, in September, 1883, growing in the crevices and nooks of the Guelph dolomites there exposed.

The following notes on the geographical distribution of this plant may be found in Macoun's "Catalogue of Canadian Plants," Part V.

Acrogens, p. 261. "A rock species, confined so far as known to the provinces of Quebec and British Columbia, where it is rare. Found by Prof. Allen on Mount Albert, Shickshock Mountains, Gaspé, Que., in 1881, growing exposed to the sun on the steep walls of ravines, at 2000 to 3000 feet elevation. (*Eaton*.) Abundant on cliffs along the Fraser River above Yale and within the Cascade Mountains; notably at Chinaman's Bluff, on rocks, Sicamous, Shuswap Lake; and summit of Mount Finlayson, Vancouver Island, B.C. (*Macoun*.) Mount Finlayson, Vancouver Island, B.C. (*Anderson*.)"

From the above it can be readily seen that so far as known *Pellæa densa* has been found in Gaspé, Quebec and in British Columbia, two extreme points of the Dominion of Canada, and therefore it seemed an interesting fact to record this species from an intermediate station in Ontario. The habitat in Ontario is similar to that in other places.

H. M. AMI.

## ENTOMOLOGY.

Edited by JAMES FLETCHER, F.R.S.C.

*Corydalis cornutus*. Several times last summer this insect was sent in by members for information as to its name and habits. This is not surprising, as it is one of the most striking in our insect fauna, and yet from its crepuscular habit of flight, but seldom observed. It is as remarkable and interesting in its earlier stages, as when it assumes the adult, or winged form. The larva passes its life in the water, and is a common inhabitant of our rivers, being quite abundant for instance in the Rideau. In this stage it lives nearly three years, and when fully grown is a dirty brown "crawler," with a squarish head armed with strong jaws. In addition to six legs, it has several tapering appendages on each side, which gives it some resemblance to much dreaded centipedes. It breathes during its aquatic existence, by means of tuft-like gills placed at the base of the lateral appendages. About June (of its third year) it becomes tired of its submarine life, and seeks change of scene, and may then be found under stones or drift wood, sometimes at quite a distance from the water. Forming a shallow cell it pupates, and about the first of July spreads its ample wings in heavy flight over the surface of the stream in which it erstwhile crept. The expanded wings measure almost six inches from tip to tip, but the heavy body of the insect causes it to be a feeble and awkward flier. The body of the adult much resembles that of the larva, but the male develops an enormous pair of horn-shaped mandibles, which give him a very formidable appearance. This species belongs to the Neuroptera, and is allied to our dragon-flies, as may be readily seen by examining the many veined wings. The larva is considered by fishermen to be an excellent bait, and has received in the United States a variety of names, among which the following are taken from *Insect Life*:—Dobsons, Crawlers, Amly, Conniption Bugs, Clipper, Water Grampus, Goggle Goy, Bogart, Crock, Hell Devils, Flip Flaps, Alligators, Ho Jack, Snake Doctor, Dragon and Hell Diver.—The adult is also known as the Hellgramite Fly.

W. H. H.

## BOOK NOTICES.

*Le Naturaliste Canadien*—Vol. xxi, No. 1.—Chicoutimi.

We warmly welcome again to our table the monthly magazine founded by the Abbé Provancher, and by him continued for many years despite numerous difficulties and discouragements. Henceforth it will be published by his pupil and co-laborer, Abbé Victor-A. Huard, of Chicoutimi, a gentleman of well-known scientific attainments. The *Naturaliste Canadien* is the only scientific journal published in the French language on this continent, and therefore appeals to a large body of our people, who are not reached by other scientific publications. We sincerely trust, therefore, that it may receive a hearty support from all those who desire to see the truths and beauties of science brought before fresh audiences. All branches of Natural History will be discussed and an elementary treatise on Zoology has been commenced with separate pagination. The editor proposes also to continue the *Faune Entomologique* of his predecessor as opportunity permits. Ed.

*The Biological Review of Ontario*. Vol. 1, No. 1.

This is a new quarterly of sixteen pages, published by an apparently newly formed society; The Biological Society of Ontario. It contains several interesting articles on birds and insects. The necessity of this publication is however, not apparent, as any of the articles contained in it could have been contributed to existing publications such as the *Ottawa Naturalist*, and the *Canadian Entomologist*. There does not seem a demand at present for an addition to the scientific publications of Canada. It would be much better for all workers to unite in supporting those already firmly established. Local societies for the study of natural history can be made very useful in bringing workers together, and in fostering an interest in the carrying on of useful investigations, but in the majority of cases the labor and expense necessary to issue special publications might be more profitably employed. Ed.

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**Annual Meeting on Tuesday, March 20th, at 4.15 p.m.**

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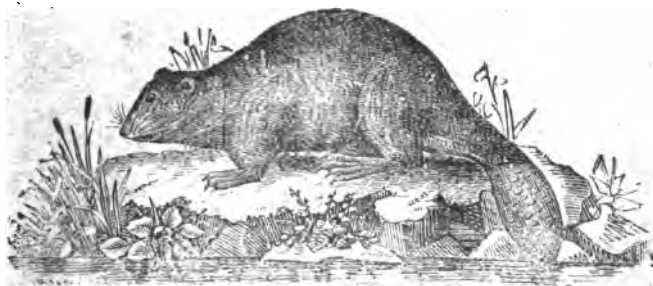
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April, 1894.

THE  
OTTAWA NATURALIST.

VOLUME VIII. No. 1.



THE BEAVER (*Castor Canadensis*, Kuhl).

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Issued April 10th, 1894.

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## TRANSACTIONS

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## ALASKA.

By OTTO J. KLOTZ, D.T.S.

(Of the Alaska Boundary Survey).

*(Read before the Ottawa Literary and Scientific Society, February 15, 1894.)*

It was not many years after the discovery of the eastern coast of America that the South Sea or Pacific Ocean was seen by Balboa from the heights of Darien. Balboa was the first European to place foot on the western coast of America.

Sir Francis Drake, the celebrated English admiral, was the first to explore the western coast northward, as far as latitude  $48^{\circ}$ , *i.e.*, north of the mouth of the Columbia River.

Having landed, he named the country New Albion, and took possession of it in the name of Queen Elizabeth; this was in 1578. The object of his exploration was to find a passage to the north Atlantic.

For the next 150 years no discoveries of importance were made on the west coast of North America.

Hitherto all discoveries in America, both on the east and west coasts, had been made by expeditions crossing the Atlantic westward, but in 1741 Vitus Bering, the intrepid Russian explorer, discovered the continent in latitude  $58^{\circ}$ , by sailing eastward from Kamtchatka. That part of the continent where Bering landed is now known as Alaska,—the subject of our discourse.

The principal motive of all the expeditions up to this time was not for the increase of geographical knowledge, but for material wealth; legitimately obtained we call it commerce, otherwise conquest.

The Spanish, after Columbus, set out to discover and obtain the silver of Mexico and Peru; and Sir Francis Drake, to discover the Spanish galleons—and he found them. The Russians were after fur, and geography was benefitted by the discovery of the Aleutian and Kurile Islands, the north-west coast and Bering Strait.

The next explorer of note on this part of the continent was the celebrated navigator, James Cook. As a navigator the merits of Captain

Cook are of the highest order. He made many discoveries in the South Sea, and added greatly to Britain's possessions. In 1778, after leaving the Sandwich Islands, which he discovered, he reached the west coast of the continent, which he followed northward in the hope of finding a passage to the Atlantic. He penetrated as far as the bay now known as Cook's Inlet in Alaska, but of course failed in the object of his search. At Bering Strait he was repelled by the impenetrable wall of ice. Returning to the Sandwich Islands to winter there, he met a sad death at the hands of the natives.

We now come to the last and most important explorer, from a geographical point of view, that laboured along the north-west coast of the continent,—George Vancouver.

As an accurate geographer I place Vancouver above anyone previous or subsequent to his time, considering the extent of coast and shore-line covered, and the time taken for executing the same. It is now a hundred years since Vancouver made his survey; look at the most recent charts extending from California to Cook's Inlet—1,500 miles in latitude—and thousands of miles of coast-line, and what do we find new—minor details—the groundwork is as prominent to-day as a century ago. To one familiar with Vancouver's work and the intricate British Columbian and Alaskan coast, the former must ever be an object of the highest admiration.

Vancouver was with Captain Cook when the latter visited the American continent. After Cook's death Vancouver was given the command of an expedition to the north-west coast of America, the object being to take over from the Spaniards their territory in that region, and to explore the coast from 30° north latitude to Cook's Inlet with a view to the discovery of an eastward passage to the Great Lakes in the British dominions.

Vancouver was then only 33 years of age. He spent the seasons of 1792, 1793 and 1794 in surveying the coast, wintering in the Sandwich Islands. He died when he was but forty, and before he had quite finished the narrative of his work. His zeal led him to take an active share in all operations, and the hardships he thus suffered tended, no doubt, to shorten his life. He was a man of great tact, humanity, generosity, and uprightness of character.

The man who finally established the Russian Empire on the North American continent was the iron-willed Baranov, and the extension of the Muscovite's dominions was due to the value of the fur trade,—sea otters and seals.

In 1797, the various trading companies of Eastern Siberia and the American colonies were consolidated with the Russian-American Company, which, in 1799, obtained a charter from the Imperial Government, granting it exclusive rights in the new Russian possessions. This charter marks an epoch in the history of Alaska, which from that time until the transfer of the country to the United States became identical with that of the Russian American Company.

In 1811, the Russians established themselves on the coast of California, the object being to prosecute agriculture and thereby make California the source of supply for provisions, but in this respect the enterprise proved a failure; for the Siberians and Aleuts, who were placed there, were but very indifferent farmers. Between the Stikine and Bodega Bay in California the Russians never had an establishment.

In 1774-75 the Spanish navigators, Perez and Quadra, made some explorations on the west coast, and later Captains Meares, Portlock and Dixon.

We will now turn our attention to the physical features of the country. The word Alaska, or Aliaska, was first applied to the narrow peninsula of the north-western most part of the North American continent, and extending into the Pacific to where the chain of the Aleutian islands begins. Now, the word Alaska is used to designate the vast territory lying between the Arctic and the Pacific and west of the 141st meridian, together with a narrow strip along the coast extending southward to Portland Canal, and including the adjacent and Aleutian islands. The coast of Alaska, washed by the Pacific, sweeps northward and westward from Dixon Entrance in a mighty curve, measuring over 1,200 miles, to the western extremity of the Alaskan peninsula; and from here again the Aleutian chain of islands stretches, far towards the coast of Asia, in another long curve of nearly 1,000 miles. The most southerly part of the latter curve is in latitude  $51^{\circ} 30'$ , that is, about the latitude of London, England. The most northerly part of Alaska is at Point

Barrow in the Arctic Ocean. The area of land comprised within the limits of Alaska has been estimated at 531,000 square miles, one-sixth of the total area of the United States.

The south-eastern part of Alaska, the narrow strip already mentioned, and which at the present time most interests us on account of its undefined boundary, is shielded from the open sea by a vast archipelago of islands, large and small, 1,100 in round numbers, most of these being mountainous throughout, and all covered with a dense growth of spruce, hemlock and cedar.

The islands vary in size from 125 miles in length to mere definitions. Beside the channels, straits, bays, inlets and canals found here, the fiords of Norway and scheres of Finland sink into insignificance.

As we proceed northwesterly along the coast, the mountains increase in height culminating in the lofty St. Elias on or near the international boundary. His foot is laved by the Pacific, while his snowy head is wrapped in clouds. Mont Blanc, the giant of European mountains, would need a pedestal 3,000 feet high to bring it to the height of our international landmark.

The highly mountainous character of the coast line continues to the extremity of the Alaskan peninsula.

On rounding the peninsula and following the shore line, a total change of the aspect of the coast can be observed. Low, sandy reaches and slightly elevated moorland cover the wide interval between the mountains and the shores of Bering Sea. Similar it is along the Arctic Ocean with occasional rocky spurs and steep cliffs.

The great highway of the interior of Alaska is the Yukon, one of the large rivers of the world. In some parts of its course, through the tundra regions, it is several miles in width. Its vast unsurveyed deltoid mouth makes navigation, with anything but light-draught vessels, impossible.

The length of coast line of Alaska's mainland and islands is nearly four times that of all other parts of the United States combined, being over 26,000 miles, while that of the rest of the United States, from Maine to California, is only about 7,000 miles.

The climate of the Alaskan coast regions is much milder, even in

the higher latitudes, than it is in the interior, or in corresponding latitudes on the Atlantic coast ; this is easily explained and understood when the natural forces productive of this milder temperature are contemplated. The most important among them is a thermal current resembling the Gulf Stream in the Atlantic. This current, known as the Japanese or Kuro Siwo, has its origin under the equator near the Molucca and Philippine Islands, passes northward along the coast of Japan, and crosses the Pacific to the southward of the Aleutian Islands, after throwing a branch through Bering Sea, in the direction of Bering Straits. The main current strikes the Queen Charlotte Islands, where it divides, one branch going south along the coast of British Columbia, while the other turns northward towards Sitka, and thence westward to the Kadiak and Shumagin islands. The comparatively warm waters of these currents affect the temperature of the superjacent atmosphere, which, absorbing the latent heat, carries it to the coast with all its mollifying effects. Thus the oceanic and atmospheric currents combine in mitigating the coast climate of Alaska, and the process is greatly aided by the configuration of the extreme north-western shores of the continent, backed as they are with an almost impenetrable barrier of lofty mountains, which holds back from the interior the warm, moist, atmospheric currents coming in from the ocean, deflecting at the same time the ice-laden northern gales coming from the interior.

The force of these influences as mitigating the coast climate of Alaska becomes evident, when it is stated that the mean winter temperature of Sitka is nine degrees higher than that of Halifax, although Halifax is nearly 900 miles further south than Sitka.

It is obvious that with the presence of these warm, moist, currents, precipitation must be great, and so it is. The greatest rainfall on the continent of America is found on its north-west coast. The maximum recorded annual precipitation is 134 inches, or a little over eleven feet. Here in Ottawa we have about three feet, and think ourselves fairly well supplied at that.

It is not alone the excessive rain that makes the coast of Alaska somewhat undesirable as a place of abode, but the rain that does not come down, the mist and fog. The number of days in a year on which

rain has fallen at Sitka has reached as high as 264. No wonder that some of those who have been in Alaska believe that at man's creation a web-foot was forgotten.

Across the mountains in the interior, both of Alaska and British Columbia, the precipitation is very much less, and the range of temperature very much greater.

On account of the mild climate the snowfall on the coast is not great,—less than we have here.

Among other meteorological phenomena to be noted is the wind. In most localities and regions it is a simple matter to tell in which direction the wind is blowing, but not so on the Alaskan coast. It is something like trying to tell which way water is running in an eddy or whirlpool. Out in the broad ocean the wind has undoubtedly a constant direction, for the time being, but when it approaches the coast, passing through long narrow channels, over mountains, down mountains, around some headland or promontory, buffeted from side to side, its direction is difficult to determine, for in a trice it changes. The severest winds in the summer are the 'south-easters.'

Based upon theory and confirmed by experience, the barometer is, par excellence, the instrument for foretelling the weather, but we must draw the line at Alaska. Everywhere else we pin our faith to the barometer, but here the barometer is impotent ; it does nothing to aid, and everything to confuse and distress the sailor and surveyor.

The safest prediction to make is, that it will rain to-morrow, and nine times out of ten you'll be about right.

How one does enjoy a day when the sun shines ! The joy is emphasized by the privation.

It is said that the greatest volcanic region in the world lies in the north-west part of the United States, occupying a large tract in Idaho, Washington, Oregon and California. The last eruption in this region is said to have been that of Mount Baker near the British Columbia boundary in 1870. However, Alaska has still several active volcanoes, but none on the mainland, they are in the eastern Aleutian islands.

One of the most notable features of the Alaskan coast is the glaciers. Whenever the annual snowfall on mountains is greatly in excess of

evaporation and of degelation, glaciers must necessarily be formed. Before the glacier is born, we have immense snow-fields or nevés. Through accumulation the snow becomes compressed, and this process continues until ice is formed. Ordinarily speaking, ice is a solid, but in reality it is not ; in fact, an absolute solid is unknown upon the earth. The behaviour of the ice is like that of a semi-plastic body. When by motion the limit of elasticity in ice is reached and fracture occurs, regelation in a great measure preserves the continuity of the mass. Under the action of gravity and lying on the mountain sides or in depressions, the ice mass flows, and in the same sense as water flows, only of course very much slower. In a river we find the greatest current near the middle, so it is with a glacier. As different rivers have different velocities, depending upon the degree of slope, similarly do we find the rate of flow in glaciers to differ widely, and for like reasons.

Of the living glaciers of south-eastern Alaska, the Muir is the largest and offers probably the best opportunity for measuring the rate of flow. This glacier has an ice front of nearly two miles discharging into the ocean. Its vertical ice-wall at the sea is over 200 feet in height, and its area, including the névé and its ramifications, is approximately one thousand square miles, or greater than the whole of the renowned Swiss glaciers combined.

By the pursuit of the study of astronomy one is led to contemplate the utter material insignificance of man and his terrestrial domicile in the grand macrocosm,—and when one stands on this vast glacier, hears its thundering echoes as it rends and breaks in its seaward journey, as it grinds and scrapes the underlying rocks, as it changes mountains into moraines, which in time become land,—then again is he impressed with the insignificance of man's powers when arrayed against the forces of nature ;—then is a new leaf of nature opened to his view, to read its significant characters.

Measurements have been made of the recession of the Muir glacier. From them it appears that within the last few years, its average rate of recession has been nearly a thousand feet per year. The flow or forward motion of the glacier is scarcely appreciable at the sides, but in the centre it is at the rate of about 2,500 feet per year. Prof. Wright

found it, in the summer at central points and near the front, even as high as 65 feet per day. I have stated that the vertical ice wall where the glacier discharges into the sea, is 200 feet above the water, but this is by no means the total thickness of the glacier there. Soundings in the immediate front of the glacier have shown a depth of over seven hundred feet, and, as this is not enough to float a mass of ice rising as high above the water as the Muir glacier, we are forced to conclude that the ice front has a thickness of over nine hundred feet.

A wall of ice nine hundred feet high and nearly two miles long, breasting the element from which it sprang! We are struck with awe. But stop! Let us read more of history—written in characters more indelible than those of man. About fifteen miles south of the present front of the glacier, is Willoughby Island of pure rock, and over a thousand feet high, without the slightest vegetation, and showing a strongly striated surface due to glacial action. That this island was covered by this glacier within recent times is obvious to anyone who has visited the bay and noted the surrounding circumstances.

We have the record of Vancouver too, who, a century ago, passed the mouth of the bay, and reported it one mass of ice.

Hence, had we measured the thickness of the ice only a century ago, where the present ice front is, we should have found it at least 4,000 feet thick instead of 900 as at present. What stupendous change! and all almost within the space of a life. This evidence goes to show that the Muir glacier was at one time, and not long ago, much larger than it now is; but there is evidence too, that it has been much smaller, for on the west side we find a buried forest. Standing trees in situ are found there, which undoubtedly are incontrovertible evidence of a former and greater diminution of the glacier than the present shows.

To give another illustration of the rapid recession of the glaciers at present and during the past, I will quote Sir George Simpson, Governor of the Hudson's Bay Company, who, in 1841, paid a visit to Alaska. When going up Frederick Sound and Stephen's Passage he says:—"The valleys were lined with glaciers down to the water's edge, and the pieces that had broken off during the season filled the canals and straits with fields and masses of ice, through which the vessel could scarcely force her way.

The land on either side displayed to us mountains rising abruptly from the sea, and bearing a glacier in their every ravine. Earlier in the season, these glaciers would have been concealed by the snow, but now they showed a surface of green ice."

The district referred to by Simpson, I frequently visited during the past season, and along Simpson's route there is now not a single glacier reaching tide water. Many of the glaciers of which he speaks have entirely disappeared, and others show their terminals 2,000 feet and upwards from the sea. These are vast changes to occur in a lifetime. There are, however, still four living or tide-water glaciers outside of the great Muir glacier, which discharge ice and small bergs into the sea. Glacier ice differs vastly from Arctic or sea ice. The colour of the former on a face of fresh cleavage is transparent blue of transcendent beauty, impossible to describe. It is very hard and not brittle, and in the sea slowly wastes away. It is dangerous for a vessel to run into glacier ice. Sea water ice is, on the other hand, brittle, and readily crumbles under compact, and is subject to very rapid decomposition. To illustrate the latter, Prof. Elliott mentions that on the 27th of May, 1873, the ice fields still surrounded the island of St. Paul in an unbroken mass, as they had done for the preceding five months. The following morning nearly the whole mass had disappeared. As he says, "the decomposition of the ice had taken place so secretly that its final relegation to its original form was fairly accomplished almost instantly and simultaneously, and without warning to human eye; the alternate layering of salt, in ocean water ice, accounts for this peculiar vanishing of sea floes."

That the discharge of glaciers must to some extent affect the temperature of the neighbouring sea, is obvious. During the past season I took a series of temperature readings of the sea as well as of the atmosphere. The mean temperature of the sea along the coast was found to be about 49° F., while the coldest part was found in Endicott Arm, into which the Dawe's glacier discharges,—there the water registered 36° F., a temperature of water in which a misfortune with a boat or canoe would be equivalent to certain death. A marked difference is found even at the same place. The difference is produced

by the tides. When the tide is flooding we have the broad waters of the Pacific rolling towards the coast ; but at ebb tide the cold glacier waters from the shore run out and on the top, being lighter, and hence we find a diminution in temperature of about seven degrees F. From the observations it would appear that the mean summer temperature of the ocean outside of the immediate coast of south-eastern Alaska is about  $54^{\circ}$  F., which is that of the atmosphere too.

The resources of Alaska are—in order of value,—furs, fish, minerals and timber.

Among furs the seal fur stands vastly pre-eminent.

Our first knowledge of the seal dates back some two hundred years, when in 1684 William Dampier, the privateer, in his voyage round the world, visited the island of Juan Fernandez, of Robinson Crusoe fame, in the South Pacific, and there saw thousands upon thousands of the fur seal.

It appears, however, that a hundred years elapsed ere the fur became a prized article of commerce. Amongst other places in the South Sea in which formerly the fur seal abounded, may be mentioned Masafuera, the South Shetland, Falkland and Georgian islands.

Greed, improvidence and indiscriminate slaughter of old and young, male and female, in a comparatively few years brought about the inevitable, almost annihilation of the seal herds in the South Pacific. In two short years, 1821 and 1822, 320,000 seals were taken from the South Shetland islands alone. They killed all and spared none. The Falkland islands were the rendezvous of a large sealing fleet for a period of nearly thirty years,—1800 to 1826 inclusive, and during this period the whole Antarctic sealing ground was ravaged by the fur-sealers.

While British and American sealers were scouring the South Seas, the seal industry began to gain an importance in quite another quarter of the globe—the Pribilof islands in Alaska. Let us dwell for a moment on the history of the discovery of these valuable islands. The Russians, in their search for fur and new fields, reached the shores of Kamtchatka at the close of the seventeenth century, and there, for the first time, beheld the beautiful and costly fur of the sea-otter. The animal bearing this pelage then abounded on the coast, but by the

middle of the eighteenth century had been almost extirpated therefrom. However, the discovery of Bering island and the Aleutian chain furnished fresh fields for the capture of this valuable animal. But alas, the ravages of man were greater than nature's production, and towards the latter part of the last century the sea-otter gatherers found their occupation almost gone, and hence were obliged to turn their attention in another direction. Up to this time the fur seal, although noted, had not been much valued. Now, however, the Russians became interested in this animal. It had long been noticed by them as well as by the natives that the seal proceeded north through the chain of the Aleutian islands in the early summer and south again in the fall. Where they spent the summer and where they bred, was a profound mystery. It was only after eighteen years of unremitting search by hardy navigators that the El Dorado, the fog-bound Pribilof islands, was found, and by the man after whom the islands are named. This was in 1786. The difficulty of finding this place does not now seem strange, when we understand the currents, the winds and fogs of these waters. The Pribilof islands,—St. George and St. Paul,—lie in the heart of Bering Sea, and are among the most insignificant landmarks known in that ocean, and being almost incessantly surrounded by fog, afforded the fur seal the happiest shelter and isolation. During the year immediately succeeding the discovery of the islands, over 500,000 fur-seals were killed by the Russian hunters. It was obvious that such indiscriminate slaughtering could not continue indefinitely, and government control became necessary. As already stated, the outcome was the formation of the Russian-American Company in 1797, which held absolute sway in Alaska, practically until the cession of the territory to the United States in 1867.

The impetus to the seal-fur trade was given by the Chinese, who were the principal customers of the Russians. Kiachta, a town in the interior and on the Chinese frontier, was the great centre of trade between China and Russia, and thither the furs made a two-thousand-mile overland journey to be exchanged for teas and silks, principally the former. The Chinese prized this fur very highly and they were the first to discover the art of dyeing it.

Three years after the cession of Alaska, the Alaska Commercial Company obtained a twenty-year lease of the Pribilof islands, the consideration being an annual rental of \$55,000 and besides a revenue tax of two dollars on every skin taken. The maximum number of seal skins allowed to be shipped was 100,000 per annum. As the original cost or purchase price of Alaska was \$7,200,000, it is seen that the United States had almost from the beginning an income from these two small islands alone of nearly four per cent. on their investment for the whole territory.

A few words about the seal itself. Professor Elliott, of the Smithsonian Institution, spent several years on the dismal Pribilof islands for the express purpose of thoroughly studying seal life in all its phases, and to him most of our accurate knowledge of seal life is due. As already stated the first seal-fur of commerce came from the South Sea, hence the name South Sea seal still obtains, although by far the greater number of skins now come from the Alaskan or North Pacific waters. Whether ever the Alaskan seals migrated from the South Sea, thereby crossing the equator is not known, neither was it certainly known where these animals spent the winter months till this was discovered in the course of the investigations of the British Bering Sea Commission in 1891, when it was ascertained that the greater part of this season was passed in the waters adjacent to British Columbia and Southern Alaska. Prof. Elliott says, "there are few, if any, creatures in the animal kingdom that can be said to exhibit a higher order of instinct, approaching even our intelligence" than the fur seal.

A male in its prime, say six or seven years old, will measure  $6\frac{1}{2}$  to  $7\frac{1}{4}$  feet from the tip of its nose to the end of its abbreviated, abortive tail, and will weigh at least 400 pounds. The female on the other hand is very much smaller, being from 4 to  $4\frac{1}{2}$  feet long, and is only about one-sixth of the weight of the male, but is much more shapely in its proportions. The adult males are the first to arrive in the spring, between the 1st and 5th of May, on the seal grounds or rookeries on the Pribilof Islands. It may be remarked also here that after the adult males land, they never leave the island nor partake of any food whatsoever until they leave some months later in the fall to spend the winter

in more southern waters. When they arrive in spring, they are rolling in fat, and when they leave in the fall they are a bundle of skin and bones. As soon as they arrive on the breeding grounds, each one, according to his physical persuasive power, pre-empta a certain area, and remains there, awaiting the arrival of his spouses, for the seal is polygamous. Many of these adult males or bulls exhibit wonderful strength and desperate courage. Prof. Elliott marked one veteran, "who had fought forty or fifty desperate battles and fought off his assailants, who coveted his position, every time. When the fighting season was over, the veteran was covered with scars and frightfully gashed; raw, festering and bloody, one eye gouged out, but lording it bravely over his harem of fifteen or twenty females, who were all huddled together on the same spot of his first location and around him." Between the 12th and 14th of June the first of the cow seals arrive at the islands. The arrival of the cows is co-incident with the ending of the period of gestation, for one or two days after arrival the pup is born. The young are nourished by the mother, who frequently goes out to the sea to feed and bathe. The pups do not essay to swim, which they must first learn, like any boy, until they are a month or more old. The head and eyes of the female are exceedingly beautiful; the large, lustrous, blue-black eyes are humid and soft, with tenderest expression. The covering to the body of the fur-seal is composed of two coats, one having a short, crisp, glistening over-hair; and the other a close, soft, elastic pelage or fur, which gives the distinctive value to the pelt. When the skin reaches the furrier the hair has been removed and the pelage dyed.

Two-thirds of all the males which are born, and they are equal in number to the females, are never permitted by the remaining third, strongest by natural selection, to land upon the breeding ground, but this great band of "bachelor" seals, as they are aptly termed, is obliged to live apart entirely, sometimes miles away from the rookeries. In this admirably perfect method of nature are these seals, which can be properly killed without injury to the rookeries, selected and held aside, so that they can be taken without disturbing in the slightest degree the entire quiet of the breeding grounds where the stock is perpetuated. Such was, according to Prof. Elliott, the state of the rookeries in 1872-74, but

when he revisited the islands in 1890 he found that a great change had occurred. The "bachelors" no longer lay out in areas distinct from the breeding grounds, but in reduced numbers sought the protection afforded by the vicinity of the breeding grounds, so that it was no longer possible to drive the non-breeding seals without disturbance to the breeding rookeries. This great change he attributes to over-driving and over-killing of seals upon the islands and to the operations of pelagic sealers, acting concurrently. The relative importance of these causes of undoubted decline in numbers, on the Pribilof islands at least, have been earnestly discussed in connection with the Bering Sea arbitration.

When driven inland for a short distance by the natives, the seals find themselves upon the killing grounds.

Care must be taken not to urge them above half a mile an hour for overheating of the seal is very detrimental to the fur. The fur is thickest and finest in texture during the third and fourth year of life. Having arrived at the slaughtering grounds, and after the seals have cooled off, the killing begins. A hundred to a hundred and fifty are separated from the herd and on a given signal the natives, armed with oaken bludgeons five to six feet long, rapidly club and kill the unfortunate animals. They are then immediately bled and skinned. The whole work is performed in a remarkably short time. The average time taken to skin a seal is only four minutes, while the best men can do it even in a minute and a half. The skins are taken from the field to the salt house, where salt is profusely spread on the flesh-side, and they are piled up in the "kenches" or bins. After two or three weeks they become pickled and ready for shipment. Most of the skins go to London, England, for dressing and dyeing. The number of seals, male, female and young, annually visiting these islands has, from careful estimates, been found to exceed four millions.

By the middle of September the rookeries are all broken up; by the end of October, or the beginning of November all the fur-seals of mature age have left the islands. During August they shed their coats.

As practically only prime skins are taken at the islands, the great variation in seal-skin sacques is due mostly to the quality of work whereby the fur was treated and prepared for wear. A properly dyed skin,

one that has been conscientiously and laboriously finished,—for it is a labour requiring great patience and skill,—will not rub off nor “crock” the whitest linen when moistened ; and it will wear the weather for six or seven seasons without showing the least bit of dimness or raggedness. The unhairing, in which the over-hair is deftly combed out and off from the skin, is done by heating the skin to a certain point so that the roots of the fur are not loosened, while those of the coarser hirsute growth are. If this is not done with perfect uniformity, the fur will never lie smooth, no matter how skilfully dyed ; it will always have a rumpled, ruffled look. In dyeing, the liquid dye is put on with a brush and the skins hung up and dried. The dry dye is then removed, and so on until eight to twelve coats have been applied to produce a good colour. The skins are then washed clean, the fur dried, while the pelt is moist.

The fur-seal is a voracious eater. Its food is fish to the practical exclusion of all other diet. Cod, herring and salmon must lay tribute to its insatiable appetite, and the great North Pacific, 5,000 miles across, between Japan and the Strait of Fuca is its fishing pond. A low estimate of the annual consumption of fish by seals visiting the Pribilof islands, gives the enormous quantity of six million tons. As Prof. Elliott says : “The fishing of man, both aboriginal and civilized, in the past, present, and prospective, has never been, is not, nor will it be, more than a drop in the bucket contrasted with the piscatorial labour of these ichthyophagi in those waters adjacent to their birth.”

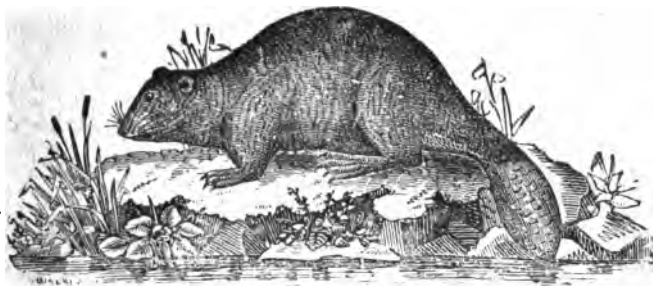
The most valuable of all furs is that of the sea-otter, which, however, is becoming year by year scarcer. Its haunts formerly extended along the whole coast of Alaska and further south, but the animal is now seldom met with. A prime skin is worth upwards of \$300.

Of land furs may be mentioned the land-otter, the brown and black bears, the beaver, the red, the black, the silver and the Arctic fox, and the mink and martin. The red fox is the most widely distributed fur bearing animal in Alaska. In south-eastern Alaska the principal fur obtained is the black bear. For hunting, the Indians are provided with rifles, and they have generally a very exalted idea of the value of their game. It is not an uncommon thing for an Indian, after not receiving the price demanded at Juneau, to start off with his canoe for Port

May, 1894.

THE  
OTTAWA NATURALIST.

VOLUME VIII. No. 2.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:  
PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued April 28th, 1894.

Published Monthly at \$1.00 per annum.

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Simpson, or even for Seattle,—one thousand miles distant on the ocean,—to sell his skins. An Indian whom I know, went in his canoe last year to Seattle and there sold his bear skins, some forty odd, and returned with \$1,400 in cash. Of the Indian character I will speak further on.

Next in value to the fur trade of Alaska stands the salmon industry which has been developed to an astonishing degree during the last decade.

The annual pack now is about 700,000 cases—nearly \$3,000,000 in value. Nearly the half of the output comes from the Karluk River on Kadiak island. This stream is not over fifty feet wide and not long, yet a dozen canneries draw their supply therefrom. Some years the run of salmon is much greater than usual. During the past season salmon were very plentiful. About the beginning of June they commence coming in from the ocean to ascend the streams for spawning. As the summer advances their number increases; up every river and stream, rivulet and rill, instinct drives them to fulfil their mission. Many succeed, but hundreds of thousands, nay millions, perish miserably at the mouths of torrential streams or cascades, attracted thither by the fresh water. They are pursued and attacked by the dog-fish, a species of shark, and one often sees salmon swimming about with pieces bitten out of their sides; and again towards fall thousands are found blind, hopelessly swimming about the mouth of their gaol. It is a pitiful sight. Their race is run. High tide piles them on the beach to rot. For miles the air becomes offensive beyond endurance, and more than once was I obliged to change our proposed anchorage on account of the shoals of dead salmon. In south-eastern Alaska all salmon are packed by Chinese who are imported for the season from Portland or San Francisco.

Next to the salmon the codfish stands foremost in quantity as well as in commercial importance. However, as the demand is limited, the development of the cod-fisheries is very limited, the annual catch being only about \$40,000. The fish next in importance is the halibut, which is found in great numbers in favoured localities in south-eastern Alaska. It and the salmon form the great staple for consumption by the natives.

There is very little halibut exported. We caught, one day, with two hooks and in less than an hour, over half a ton of halibut. It is a delicious article of food and its most toothsome part is the dorsal fin.

To the Indians the Oolachan or candle fish is of considerable importance. It is a small fish and very oily, in fact so oily, that when dry it will burn like a taper or candle, hence the name candle-fish. The oil obtained from it is used by the coast Indians as an article of trade with the interior Indians, who are very fond of it.

Numerous whales may always be seen sporting and spouting in Frederick Sound, but are unmolested by natives and whites.

The Killer Whale (*Orca ater*) is frequently seen too, and it is a sight to see a huge whale when pursued rise vertically out of the water forty feet and then strike with terrific force, splashing the water with volcanic effect.

Immense shoals of herrings visit some of the bays. However, there is only one establishment—Killisnoo—where herring are caught for commercial purposes. All the herring caught there are converted into oil, and the residue is pressed, roasted and ground and sent to the sugar plantations on the Sandwich Islands as a fertilizer. At Killisnoo, the wharf, the walks and the factory are ever wet and saturated with fish oil, and the newcomer is very apt to perform some involuntary acrobatic feats. The Indians are very fond of herring spawn. To obtain it small branches of evergreen are placed in the sea at low tide, and with the rising tide the branches become thickly covered with roe. The twigs then look as if they had been sugared. The Indians eat it right from the branches.

Next in importance to the fisheries is the mining industry. However, when one examines the cold facts about mining in Alaska, the result is not very cheering. Leaving out the Treadwell mine, on Douglas island, near Juneau, it is safe to say that more value in labour has been expended in obtaining gold than all the gold that has been sent out of Alaska, be it from placer or quartz mining, is worth.

The Treadwell mine yields a very low grade ore, but it is very easily mined or quarried, being an open mine, and there is almost an inexhaustible quantity of ore there. The company has a 240 stamp mill for

crushing the ore, and chlorination works for extracting by chemical process the finely disseminated ore. The fumes from the chlorination works have killed the surrounding forest over a large area.

The annual output from this mine is about \$800,000, of which a little over half is profit.

On several mines back of Juneau, in the Silver Bow Basin, several hundred thousand dollars have been expended in extensive hydraulic mining, but so far the net results have not been very remunerative. Prospectors' holes, and small tunnels, are quite numerous along the coast. Each in turn had its day of showing the "best indications" and then dropped out of sight.

Mining, or rather prospecting, is undoubtedly an alluring vocation. The prospector lives and starves on hope, striking it rich some day; yet, how very small is the probability of his success and how great the sacrifice he makes.

The discovery of rich gold and silver mines or diggings is not an unmixed good. The value of these mineral finds, although sometimes very rich, is generally ephemeral. The result is an abnormal prosperity of one or more towns or cities whose birth is due to the gold or silver discovery. Railroads are built, business, bustle and activity are rampant in the mining region. After a few short years, the scene changes, mines or diggings are exhausted, there is a stampede out of the district almost as vehement as there was into it. Real estate, houses, blocks, everything immovable becomes unsaleable. Many of the people of the mining region have been ruined through its shortlived prosperity. A glaring example of these conditions is the state of Nevada, which some years ago was struck by a rich mineral wave, on the crest of which Nevada was enabled to ride into full sisterhood in the Union. To-day it lies prostrate, and her whole population, spread over an area of 110,000 square miles, is less than that of the city of Ottawa. In the same relation I might mention the Fraser River and Cariboo gold diggings in the sixties. Where are to-day the signs of prosperity of those golden footsteps of years gone by? What I wish to impress is, that a country that is solely or mainly dependent on gold or silver production is a factor in unstable equilibrium. Gold and silver mining is not conducive to the permanent

settlement of a country. The great gainers by such mining regions are the outside centres of supply, whose creation is not due to the discovery of minerals, and whose permanence is dependent on other sources of business.

A far more valuable mineral than gold or silver, is coal. Although coal has been found at several points in Alaska, yet up to the present it has not been mined for commercial purposes. That country has the greatest stability whose principal resources are food, hence the ultimate and inevitable success of Manitoba and the North-west.

To sum up, the mineral resources of Alaska thus far developed are gold mines, and of these the Treadwell mine produces nearly the whole annual yield.

We now come to the last of the natural resources of Alaska, viz : timber. The public is apt to associate with the word Alaska a cold, barren, rocky country. But such is not the case, especially not in south-eastern Alaska, where, on account of the mild temperature and copious rains, a luxuriant vegetation is seen on the strip bordering the sea. Heavy carpets and festoons of beautiful mosses, luxuriant ferns and dense undergrowth, characterize the coast region. The whole area is densely wooded. The timber line is found at an elevation of about 2,500 feet. Spruce and hemlock are the predominant varieties of wood ; red and yellow cedar are also found, but in limited quantities. On deltas and sea level terminal moraines, the poplar and cottonwood are found. The alder flourishes on old moraines and on snow slides, and the crab apple is sparingly scattered through the forest.

Although the country is densely wooded, yet the timber fit for the mill is very limited, and hence no very great value attaches to it. For some, not very apparent, reason, the United States government prohibits the manufacture of lumber in Alaska for export, even into the United States. There are a number of small saw-mills in the country, which supply the limited demand for building purposes and for the shooks used by the canneries for salmon cases or boxes. The spruce grows to a very respectable size. I have measured some logs over five feet in diameter ; however, the average is under three feet. Soil there is not much, and it is astonishing on how little the trees grow. How-

ever, the nourishment is apparently not equal to the demand, for after the trees have attained a certain height the tops die, and looking over the forest from the sea it presents the appearance of hop poles.

The lumbering is all done on the immediate coast, and the logs<sup>s</sup> rolled or skidded into the sea, and then boomed and drawn by tugs to the mill.

The population of Alaska by the last census, that of 1890, gives a total of 32,000, of whom 4,300 are whites, 23,500 Indians and 2,400 Mongolians and others. There are less than 500 white women in the whole country, at which fact I think a philanthropist would rejoice.

The natives of south-eastern Alaska, with whom we are immediately concerned, belong nearly all to the great Thlinket tribe.

Everywhere in nature science is gathering facts. Facts are correlated, and cause and effect studied. Under the term cause is included the term environment. Environment plays a great part in both the animal and vegetable kingdoms. It is the key that has unlocked many of the secrets of nature, and in skilful hands will further shed light on nature's work. Thus has environment exerted its influence on the Indians in moulding their habits, customs and character, and also, to some extent, their physical traits. The island home of the Haidas in the broad expanse of the Pacific has developed them into the highest type of Indians on the coast. The Thlinket have, in general, thick, coarse, straight, black hair, large fiery eyes, a small, flat, broad nose, and large cheek-bones. As much of their lives is spent in canoes, it has impaired their powers of locomotion, and misshaped their legs, rendering them decidedly awkward on shore. Their teeth are white, but in old age become worn down by eating dried salmon on which sand and grit have gathered in the process of drying. Many of the females, in their youth, are quite rosy and comely. In complexion both sexes are surprisingly light coloured, which is not due to any admixture with whites, although admixture is not uncommon. It is recorded that formerly they bathed frequently, both in summer and winter, and thereby hardened their physique; furthermore that the children were daily bathed in the ocean; this undoubtedly resulted in the survival of the fittest. From my observations, however, I think that

this habit has gone out of vogue, judging from the faces of many of the children and grown up people as well.

The greatest curse to the Indian has been alcohol, and against this temptation he seems absolutely unable to struggle. Small-pox has ravaged the coast terribly. Rheumatism and pulmonary diseases are their worst ills, while venereal diseases are extremely destructive.

Year by year it is becoming more difficult to study the Indian, as with the increase of travel and commerce, and consequent contact with whites, he is steadily losing his native characteristics and adopting instead our customs and habits. They are reserved and taciturn and show an utter indifference, in fact contempt, towards the whites when by chance they meet on a common camping ground. This latter characteristic is different from that of our North-West Indians, who are also taciturn, but very inquisitive to see what is to be seen. They are not as fond of display and parade as formerly ; however, on the 4th of July, a day they anxiously look forward to, many of them are clothed with all the fineries, not Indian, but the best to be had in the stores. Last 4th of July I happened to be at Juneau, where hundreds of Indians had gathered to attend and take part in the festivities. To one accustomed to seeing concourses of Indians in the Northwest it was a sight to study. Many of the young Indian women were dressed in silk, or satin, or velvet ; in white, red, blue, yellow or black ; the hair "banged" and crowned by a nobby hat ; the face powdered à la mode ; the feet encased in buttoned kid boots, and perfume and jewelry galore. The older ones content themselves with wool or cotton fabrics ; only one squaw did I see with the time-honoured blanket. The young men were similarly well dressed, wearing nice store clothes, silk-trimmed spring overcoats and watches, and smoking cigars. The whole illustrated what has been abundantly proved, and that is, that commerce is the great civilizer of native races.

Dancing and singing were formerly a part of their ceremonies of welcome, trade and war ; but now the dancing is that of Americans and confined generally to festive gatherings. At the dance or ball given on the above day in the Juneau Opera House, the grace with which some of the Indian ladies waltzed was very marked. By nature the Indian

is rather indolent, but his ambition for wealth and its inherent mark of distinction makes him enterprising. They have considerable business judgment, and it is a rare occurrence that a white man gets the better of a bargain with an Indian of south-eastern Alaska. When first visited by the early voyagers, these Indians, like all others on the coast, were bold, arrant thieves; to-day, however, this accusation cannot be made against them. They have great respect for the aged; between the sexes the rights of the women are regarded, and they live on terms of equality. They have considerable artistic taste in the use of colours, are advanced in the arts of carving in wood, slate and metal, and have fair abilities in drawing and designing. In the latter I found a marked characteristic, and that is, the absence, or scarcity at least, of curves in their designs, they being nearly all angular and rectangular.

The totem poles one finds in the villages throughout south-eastern Alaska are relics of the past. They are carved tree trunks, upwards of thirty feet high, with grotesque figures which, in a measure, represent a genealogical tree. A totem is simply an organization of consanguineal kindred into a recognized group or band. The organization is based on mother-right, (such as rank, wealth, property etc.) received from the mother. The most prominent totems met with are the wolf, raven, eagle, bear and whale.

The practice of mutilation is older than recorded history. Man never has been satisfied with either his structure or appearance, and has constantly endeavored to improve upon both. However, at present little mutilation is done. Occasionally one meets a woman with a pierced under lip, a projecting plug being inserted into the hole; and also women with tattooed arms and hands. The most hideous practice still in vogue among the women is that of painting the face black, leaving a large circle around the eyes unpainted, thereby making the face most repulsive. The paint consists of fish-oil and charcoal, and acts as a preventive against mosquitoes. Another use is for improving the complexion, and for this purpose it is efficient. I recollect seeing a squaw going off with a blackened face for some weeks on a hunting tour with her husband; after they returned, she washed herself and emerged like a butterfly from the chrysalis, clean, fair and bright.

The canoe is to the North-west coast what the camel is to the desert. It is to the Indian of this region, what the horse is to the Arab. It is the apple of his eye and the object of his solicitous attention and affection. The canoes are hewn out of one solid cedar trunk, and are now seldom made over 30 feet long, although formerly they were made over twice that length and carried several tons. Every year finds the Indians more and more abandoning their old form of one-room houses, earth floor and central fireplace, and adopting our manner of building. In short, the Indian is day by day becoming more of a white man. He is still fond of dogs, ad infinitum one might say, especially when one hears the apparently preconcerted simultaneous howl of the colony. Their food, they mostly find on the tide flats, where the Indian table, too, is set twice a day. The advance of civilization has not robbed the Alaskan Indian of his means of sustenance, as the disappearance of the buffalo has our North-west Indian. Commerce and civilization can never rob the Alaskan Indian of his food. Sepulture as now practiced is mostly by inhumation-at-length. They also buy cheap paper-covered trunks into which the corpse is packed and placed in a small enclosure or house, over which float streamers or flags to ward off the evil spirits. Cremation and aerial deposition are not practiced now. The shamans, or medicine-men, witch-craft, and slavery received their quietus after the United States came into possession of Alaska. Similar it is with the potlach, or grand party as we would call it, which served as in modern society to a great extent to give a social standing. The Indian often gives potlaches beyond his legitimate means; he probably anticipated the white man. At the ceremony of an Indian house-warming at Wrangell it cost the host \$5,000 in blankets and other presents.

In conclusion I will speak briefly of the Survey being made in Alaska by our Government.

The definition, by treaty in 1825, of the boundary line of Alaska was the outcome of, and a side issue in the protest of Great Britain against the unwarranted assumption by Russia of exclusive jurisdiction in Behring Sea. The British position was at the time tersely stated by the significant words—"We negotiate about territory to cover the remonstrance upon principle."

The treaty made the boundary in south-eastern Alaska run along the summit of the mountains situated parallel to the coast, but in no case to extend farther inland than ten marine leagues. Although at the time of the treaty, Vancouver's and other charts existed, showing accurately the shore line and islands, yet of the true topography of the country itself little was known ; in fact, our survey is the first attempt to determine the topography on which by the terms of the treaty the position of the boundary line depends ; hence it will be seen and understood that the joint survey now being made is not to define the boundary line, but to get the topography of the country adjacent to the coast, so that, thereafter, intelligent discussion can take place and ultimate delimitation on the ground be effected.

The system of photo-topography, which was developed by the Surveyor-General, Captain Deville, and so successfully applied in our Rocky Mountains, was adopted by the Canadian Boundary Commission for its work in Alaska, where, on account of the intensely mountainous character of the country it was especially applicable. It may be mentioned with pride that the officers of the United States government who were in the field with us, acknowledged our method far superior to theirs, in fact said that our method was the only practicable one in such a tumultuous region.

Armed with a specially constructed camera and small transit instrument, the surveyor with his assistants climbs the mountain peaks and there makes angular measurements, and takes photographs of the surrounding country within a radius of at least ten miles. It is scarcely necessary to say that his work is intensely laborious, and often dangerous to life ; breaking his way through jungles of dense undergrowth in the primeval forest, fighting that poisonous shrub, the devil's club ; crawling up and around precipices, crossing treacherous glaciers with yawning crevasses and chasms ; standing with wet clothes on a pinnacle in a howling wind and at times in a snow storm : such are a few of the trials and tribulations of the photo-topographer ; but he is happy as long as he gets good views ! However, when, time and again, he has to ascend thousands of feet the same mountain only to find himself enveloped in a fog or clouds at the summit, then !—well, he climbs again.

The alpenstock is an indispensable adjunct for climbing. Inexperienced men invariably consider a gun or rifle very desirable in climbing, "to shoot a bear, don't you know." Suffice it to say, no bears were shot while mountain climbing. The picture presented to one, on one of the summits, is well described by a recent writer thus :

"What a scene of desolation  
I saw from the mountain peak,  
Crag, snowfields, glaciation  
Unutterable to speak."

Scarcely a vestige of verdure is in sight, arctic are the surroundings. What grand upheavals of nature come under the topographer's gaze ! Dozens, nay, hundreds of ice-bound and mountain-hemmed lakes come under his view and tell of receding glaciers. He traces from the névé and melting glacier, rills to creeks, creeks to streams, and streams to rivers, until they enter whence they came, the ocean.

Camping along the Ottawa is considered sport and healthy outdoor exercise ; in Alaska with the incessant rains, it is considerably the reverse. Clothes, boots, provisions, everything gets mouldy in camp. The precipitous nature of the shores makes good camping ground very scarce, and an undue regard for the high or spring tides caused some rude awakenings at night, to find oneself unceremoniously a dweller in the Pacific or living in Venice. Nearly all the ascents were made directly from the sea-shore.

The highest mountain climbed was within a few feet of 7,000 feet above the sea. The experienced climber covers about a thousand feet an hour. The descent, when over snow fields, is sometimes made at a dangerous velocity, by squatting down and tobogganing, using the alpenstock for steering. This method is rather risky, for an unseen precipice may some day be the cause of an untimely end to the topographer's career.

Several hot springs were encountered on the work. I took the temperature of a sulphurous one near the coast, and found it to register 164° F., a temperature sufficient to boil eggs. Hot springs and glaciers,—a peculiar combination !

On account of the continued saturated condition of the atmosphere

great care must be exercised with photographic plates, for which reason they are kept in tin boxes, water and air-tight.

During the past season about seven hundred photo-topographic plates were obtained, covering an area of nearly five thousand square miles ; besides nearly a hundred 8 x 10 plates, making a collection of photographs showing glaciers, glaciation, and glacial action of the greatest interest and value.

I will dwell for a moment upon climate, with special reference to an ice age or glacial period. The absolute amount of heat received annually from the sun is not known, nor the fluctuations in the emanations from the sun, nor his rate of cooling ; all of which affect both the meteorological and climatic conditions upon the earth. However, certain it is, that astronomical conditions, periodic in their function, must produce some effect on climate. Climate, and its offspring, meteorology, are complex subjects. They are the effects or phenomena of various causes interlinked and interwoven to such a degree that up to the present time their true history has not been written. We know that summer and winter are due to the obliquity of the axis of the earth to the plane of its orbit. By summer we understand the time from the vernal to the autumnal equinox, and winter from the autumnal to the vernal. The proportion of heat received in summer is to that received in winter as 63 is to 37 ; and this is practically constant for all time ; for the obliquity changes but very little.

If there were no other changes in the relative position of the earth towards the sun, there would be no change of climate further than that indicated above ; but, as a matter of fact, the earth, revolving in an elliptic orbit around the sun, does not preserve the same orbit through all times, that is, the eccentricity changes. Furthermore the line of equinoxes passes around the ecliptic, and this, combined with the change of eccentricity of the earth's orbit, produces a change in the climate by changing the lengths of summer and winter.

For instance, at present our summers are seven days longer than our winters, there being 186 days between the vernal and autumnal equinoxes, and 179 between the autumnal and the vernal. The time required for the line of equinoxes to make a complete revolution is, in

round numbers, 21,000 years ; so that in 10,500 years (one half of that time) the conditions will be reversed ; that is, we shall have a winter of 186 days, and a summer of 179 days. Then we shall have for winter the 37 per cent. of the annual heat spread over 186 days, whereas now it is spread over only 179 ; and there must be, in consequence, a lowering of temperature, which, when counted from absolute zero or the temperature of intersellar space, must be quite an appreciable quantity, and one not to be neglected. The maximum difference there can be between winter and summer is about 25 days, and this occurs when the orbit of the earth has its greatest eccentricity, and the line of the equinoxes is perpendicular to the major axis of the earth's orbit we have then the maximum astronomic cause for glaciation.

Another important point which must be taken into consideration is this, that the total amount of heat received upon a hemisphere at any time, and in any geologic age, is practically constant, or nearly so.

Now, as the total annual heat is constant, and the ratio of heat received in summer and winter is also constant, but the lengths of winter and summer vary, therefore the average amount of daily heat received in winter and summer during different years varies. This gives us a clue for one of the causes for an ice age.

The condition favourable for glaciation is, naturally, one where the winter is longer than the summer, and whenever that condition obtains in one hemisphere of course the reverse obtains in the opposite one. We can safely say, therefore, that 10,500 years ago the northern hemisphere, if not glaciated, was at all events, disposed towards glaciation, and very likely, in part, was glaciated. From astronomic reasoning, there would be a succession of periods tending towards glaciation, the effect of which other causes may mitigate, or even obliterate, or on the other hand, intensify.

The distribution of land and water, atmospheric and oceanic currents, of course, exert a powerful influence on the conditions brought about through astronomic causes. The preponderance of land in the northern hemisphere may possibly be due to the fact that during the critical time of crust-forming that hemisphere had its winters for thousands of years in aphelion.

It is not my intention to go further into the question of ice ages, but I simply wish to show that the question of ice ages or glacial epochs is one which properly falls also within the sphere of mathematicians and astronomers, and is not one wholly belonging to the realm of the geologist.

---

(Mr. Klotz then showed, with the aid of a lime-light, 28 typical views of Alaska, taken in connection with the Boundary Survey. Numerous dead and living glaciers were thrown on the screen, showing lateral, median and terminal moraines; also the erosive and grinding action of glaciers. The principal features of each view were lucidly explained.)

The largest glacier in Europe is the Aletsch, which measures about fourteen miles from its névé to its foot. The celebrated Mer de Glace, which descends from Mont Blanc to the valley of Chamounix, is about eight miles long below the névé-field. On our survey the névé of the Foster Glacier was found to extend into the interior thirty miles, and this is by no means the largest one. The glaciers of the Alps are mostly confined to the northern side of the mountains and none of them descend below 4,000 feet.

A feature of a once glaciated area, is the numerous lakes that are left after the recession of the glaciers; partly in basins that have been scooped out, and partly in basins that have been formed by damming of the valley by moraines. Those of the latter kind become relatively soon drained by the erosion of the barrier. In Tyrol, during the past century, no less than one hundred and eighteen lakes have disappeared, as found by comparison of maps covering that period.

Knowing the origin, then, of many lakes in northern latitudes we are not surprised at the innumerable lakes that dot Canada from Halifax to the Mackenzie.

Norway presents a similar picture.

#### REFERENCES

"The Seal Islands of Alaska," H. W. Elliott.

"The Coast Indians of Southern Alaska and Northern British Columbia," by A. P. Niblack.

Eleventh Census, 1890, U.S.

## Abstract of Meteorological Observations

	MONTHS..				
	Jan.	Feb.	March.	April.	May.
Average height of barometer at 32° and reduced to sea-level.....	29.997	30.147	30.067	30.047	29.863
Highest barometer.....	30.650	30.951	30.611	30.615	30.299
Lowest barometer .....	29.086	29.300	29.519	29.244	29.267
Monthly and annual ranges .....	1.564	1.651	1.092	1.371	1.032
Average temperature of the air (Faht.)....	3.61	9.82	23.19	36.47	53.33
Difference from average .....	-7.21	-2.58	+0.29	-1.13	-2.17
Highest temperature.....	40.2	38.8	45.0	65.2	87.5
Lowest temperature.....	-26.2	-23.1	-5.2	9.0	33.8
Monthly range .....	66.4	61.9	50.2	56.2	53.7
Average maximum temperature.....	11.50	19.21	31.99	46.16	64.53
“ minimum temperature.....	-5.45	-1.52	13.84	27.49	43.91
“ daily range .....	16.95	20.73	18.15	18.67	20.62
Average pressure of vapour .....	0.050	0.065	0.112	0.178	0.301
Average humidity of the air.....	83	83	82	79	73
“ temperature of the dew point	3.0	9.0	20.8	31.6	45.2
Amount of rain in inches .....	R.	0.52	1.04	2.38	4.69
Difference from average .....	-0.59	-0.02	+0.17	+0.87	+2.37
Number of days of rain .....	1	2	8	15	17
Amount of snow in inches.....	30.0	26.0	2.5	5.9	.....
Difference from average .....	+7.8	+2.8	-12.2	+0.7	*
Number of days of snow.....	13	12	6	5	.....
Percentage of sky clouded .....	65	59	51	56	58
Average velocity of wind .....	5.95	7.32	9.81	9.70	8.20
Auroras .....	0	2	1	1	0

## at Ottawa for the Year 1893.

MONTHS.							YEAR.
June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
29.985	29.922	29.993	30.020	30.066	30.033	30.120	30.022
30.217	30.219	30.268	30.364	30.608	30.733	30.956	30.956
29.616	29.589	29.483	29.534	28.957	29.491	29.357	28.957
0.601	0.630	0.785	0.830	1.651	1.242	1.599	1.999
68.05	66.67	65.94	53.56	48.03	32.68	11.53	39.41
+1.85	-2.63	-0.66	-4.44	+3.38	-0.69	-4.56	-1.71
91.5	88.3	94.8	76.3	72.9	54.2	37.0	94.8
49.5	49.0	45.5	34.9	21.5	7.5	-25.2	-26.2
42.0	39.3	49.3	41.4	51.4	46.7	62.2	121.0
78.79	78.50	77.83	62.92	58.75	38.58	21.46	.....
58.05	56.74	55.95	44.44	38.68	24.85	0.45	.....
20.74	21.76	21.88	18.48	20.07	13.73	21.01	19.40
0.545	0.486	0.504	0.338	0.272	0.161	0.080	0.258
78	73	78	80	76	82	85	79
61.4	58.2	59.2	48.2	42.5	29.1	11.0	.....
4.40	5.67	8.04	3.24	1.18	1.43	0.51	33.10
+1.74	+2.54	+4.80	+0.58	-1.25	-0.18	-0.21	+10.82
13	14	15	15	9	10	5	124
.....	.....	.....	.....	*	5.0	44.0	113.4
.....	.....	.....	.....	-1.0	-4.6	+20.4	+13.9
.....	.....	.....	.....	1	11	19	67
49	52	52	55	55	65	67	57
5.40	6.11	5.06	5.69	7.75	7.42	8.24	7.22
0	0	2	3	3	0	1	13

## Frequency of the Different Winds at 7 a. m., 2 and 9 p. m. Daily.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
January.....	1	4	21	1	1	1	28	10	26
February.....	5	5	14	3	5	5	26	7	14
March.....	10	2	17	1	10	24	19	6	4
April.....	10	4	17	2	9	9	21	9	9
May.....	5	1	22	3	12	15	16	8	11
June.....	8	12	6	7	20	9	16	1	11
July.....	4	1	4	3	12	8	33	16	12
August.....	15	7	10	2	11	7	17	17	7
September.....	9	5	6	4	13	11	21	12	9
October.....	3	4	20	3	20	17	9	11	6
November.....	6	4	17	6	9	18	19	6	11
December.....	4	7	21	1	5	17	18	10	10
Year.....	74	56	175	36	127	141	243	113	130

Coldest day of Year, 11th January. Mean temperature  $-17^{\circ}80$ .

First rain of year, 29th January.

First thunder storm, 8th April.

Last snow of season, 15th April, 5 inches fell.

Last frost of season, 29th April.

Warmest day of year, 15th June. Temperature  $76^{\circ}48$ .

Heaviest rain storm of year, 28th-29th August, 3.92 inches fell.

First frost, 4th September.

First entry of temperature below  $32^{\circ}$ , 17th October, ( $28^{\circ}9$ .)

First snow 29th October, not measureable.

First entry of temperature below zero, 2nd December ( $-2^{\circ}$ .)

Heaviest snow storm of year, 15th-16th December, 16 inches fell.

## EXCURSION No. 1.

The date for the first Excursion has not yet been decided upon. It will probably be to one of the picturesque and favorite localities north of the Ottawa River. Due notice will be given by the Secretary when arrangements have been concluded.

Excursion to Cascades, June 16th, 1.30—8 p.m.  
Members 40 cts., Non-Members 50 cts., Children half-price.

June, 1894.

THE  
OTTAWA NATURALIST

VOLUME VIII. No. 3.



THE BEAVER (*Castor Canadensis*, Kuhl).

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PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued June 6th, 1894.

Published Monthly at \$1.00 per annum.

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EXTRAS — BILLINGS, W. R. Palæontology. An elementary lecture,  
pp. 11, 5c.

ELLIS, R. W. Asbestos ; its history, mode of occurrence and  
uses. pp. 24, 10c.

## OTTAWA FIELD NATURALISTS' CLUB.

*Treasurer's Balance Sheet Club Year ending 20th March, 1894.*

## RECEIPTS.

Balance on hand from 1892-93 .....		\$34 20
Subscription fees received :—		
Arrears of previous years .....	\$68 00	
For current year .....	149 00	
For 1894-95 (paid in advance).....	6 00	
	<hr/>	223 00
Received for advertisements in NATURALIST.....		24 00
"    "    "authors' extras" .....		4 25
Net proceeds of excursions .....		24 35
		<hr/>
		<u>\$309 80</u>

## EXPENDITURE.

Printing Ottawa NATURALIST Vol. VII.....	\$216 13	
Postage on same.....	14 45	
	<hr/>	\$230 58
Printing "authors' extras" .....		9 75
General printing and stationery.....		5 35
"    postage.....		10 20
Expenses of soirees.....		21 00
Book-case for library.....		7 00
		<hr/>
		\$283 88
Balance on hand.....		25 92
		<hr/>
		<u>\$309 80</u>

A. G. KINGSTON,  
*Treasurer.*

OTTAWA, 20th March, 1894.

Audited and found correct.

J. BALLANTYNE, }  
WM. A. D. LEES, } *Auditors.*

OTTAWA EAST, 28th March, 1894.

## REPORT OF THE BOTANICAL BRANCH, 1893.

*To the Council of the Ottawa Field-Naturalists' Club :*

The Leaders have much pleasure in reporting that a considerable amount of good work has been done during the past season, several new plants not previously reported from this locality having been discovered by members of the Club at the Excursions and sub-excursions. Good work has also been done at excursions made by one or two members who have visited localities too far distant to be reached by the whole section. Excursions were made to various points on the Gatineau Valley Ry. by Messrs. R. B. Whyte and John Craig and Prof. Macoun. Mr. Scott and Mr. Fletcher made several visits to the Mer Bleue and Cassleman, and made interesting collections. Mr. R. H. Cowley makes the following interesting report : " The colony of the introduced North Western plant—*Grindelia squarrosa*—first observed some years ago at the old Eddy mill-site in Nepean, is still in a prosperous condition. It is multiplying rapidly and seems to have found a congenial habitat." During the third week of August Mr. Cowley paid a brief visit to Clarendon, in Pontiac County, and visited a few of the neighboring islands in the Chats Lake, on all of which he found many specimens of *Lobelia Kalmii*, *Potentilla fruticosa*, *Pycnanthemum lanceolatum*, and *Aster ptarmicoides* in full flower. The last three were first found by Mr. R. H. Cowley and Mr. R. B. Whyte on the Chats Island in 1891.

The following plants may be mentioned among the more interesting of the season's collections :

RANUNCULUS SCELERATUS, L. This addition to the *Flora Ottawensis* was made by Mr. R. B. Whyte. The specimen was found at Borthwick's Springs on July 8th.

MYRIOPHYLLUM ALTERNIFOLIUM, DC. Specimens of this rare water weed were found by Mr. Wm. Scott in Brigham's Creek, Hull, Que. They were in fine condition in September and were growing in about a foot of water. The only other recorded locality for this plant is " Lake Memphremagog, July, 1866." (Macoun's Cat. V, p. 322.)

LONICERA CÆRULEA, L. The two bushes of this species which grow near the gas spring in the Mer Bleue were visited this year and good specimens obtained.

*L. OBLONGIFOLIA*, Muehl. In a small swamp 4 miles past Casselman on the right hand side of the railway, there are hundreds of bushes of this pretty honeysuckle. The bushes are about three feet high, oval and symmetrical in shape. The long pedicelled flowers, which distinguish this from the last species, open early in June and are followed by the two purple, nearly distinct berries in July.

*SENECIO AUREUS*, L. var. *BALSAMITÆ* T. & G. Specimens of this variety were collected by Mr. Cowley near the old Bristol wharf up the Ottawa, growing below high water mark in crevices of limestone rocks.

*ARTEMISIA CANADENSIS*, Michx. This interesting addition to our local flora was made by Mr. W. E. Saunders, who found it growing on the rocks below the Hog's Back. It has also been found at Mermaid Mountain, Wakefield, by Mr. R. B. Whyte.

*LACTUCA SCARIOLA*, L. The Prickly Lettuce, an introduced plant, was found by Mr. Fletcher along the Canada Atlantic Ry. near Stewarton and good specimens were secured.

*PHYSALIS VIRGINIANA*, Mill. On a few sandy knolls in a meadow at Clarendon Mr. Cowley found some vigorous colonies of this plant. There were mature fruit and fresh blossoms on the same specimens although the plants had been cut down by the mowers only a few weeks previously.

*LOPHANTHUS NEPETOIDES*, Benth. This is a rare plant here, so far having only been found at Casselman; good specimens were collected this year by Mr. Scott.

*AMARANTUS BLITOIDES*, Watson. Found at the side of the road which leads from Rockcliffe to Hemlock Lake by Mr. Scott. (Sep. 3). This species had evidently been overlooked by less wide-awake collectors than Mr. Scott. It has much the appearance of the prostrate form of *A. albus*, L. which frequently grows in roads; but can at once be separated when examined.

In *A. albus* the floral bracts are twice longer than the flowers, while in *A. blitoides* they are shorter than the flowers, and the seed of *A. albus* is less than half the size of that of *A. blitoides*.

*LISTERA AUSTRALIS*, Lindl. A bed of this rare little orchid, not previously recorded as having been found in Canada, was discovered by

Mr. Fletcher, beyond the Poplar Ridge in the Mer Bleue on June 21.

*ARETHUSA BULBOSA*, L. This lovely orchid was found in great profusion by Mr. Scott near the gas spring in the Mer Bleue in the second week of June.

*POLYGONATUM GIGANTEUM*, Dietr. Half a dozen specimens of this handsome plant were collected about a mile and a half from Casselman by Mr. Fletcher. They were growing in low ground along the Canada Atlantic Railway and undoubtedly indigenous. Stems 3-4 feet high, peduncles 3-6 flowered. The occurrence at Casselman of this and such plants as *Thaspium aureum*, Nutt., *Aster Nova-Angliæ*, L., *Rudbeckia laciniata*, L., *Helianthus decapetalus*, L., *Phlox divaricata*, L., *Saururus cernuus*, L. & *Carya alba*, Nutt. is very remarkable, for all belong to a flora much more western and southern than that of Ottawa.

*POTAMOGETON VASEYI*, Robbins. Fine specimens of the rare form with emersed leaves and fruit spikes were collected by Mr. Scott, in August, at Kettle Island.

*ERIOCAULON SEPTANGULARE*, Withering. Specimens of this curious plant were collected in Lake Harrington, Que., on September 22. It had once previously been found by Mr. Latchford at Masham, Que.

*ERIOPHORUM RUSSEOLUM*, Fries. The cotton rushes were exceptionally beautiful last season. *E. vaginatum*, L., with large silky white heads and the similar *E. russeolum* with its no less handsome tufts of tawny silk were very conspicuous in the Mer Bleue. *E. gracile*, Koch, and *E. polystachyon*, L. formed large beds of waving white tassels along the railway from the St. Louis Dam to the Rideau River. Later in the season *E. Virginicum*, L., both the type and the white variety were abundant at the Mer Bleue.

*HELEOCHARIS TENUIS*, Schultes. This species omitted from the Flora has been found by Mr. Cowley at Clarendon. It also occurs at several places about Ottawa.

*ERAGROSTIS REPTANS*, Nees. Two localities for this pretty little grass have been discovered near Ottawa by Prof. Macoun. On the road along the Ottawa to the west of the wharf at Buckingham in September, 1891, and in the same month in a disused quarry to the north of Brigham's Creek, Hull, Q.

*PHRAGMITES COMMUNIS*, Trin. A few patches of about 6 stems were found in a swamp 4 miles past Casselman.

*GLYCERIA ELONGATA*, Trin. Large beds of this elegant and rare grass occur along the streams running into the Nation river, along both banks, at Casselman. Specimens were found at the same place by Mr. Fletcher ten years ago, but it had not been collected since till rediscovered again this year by Prof. Macoun and Mr. Scott.

*ASPIDIUM ACULEATUM*, Swartz, *var. BRAUNII*, Koch. Several fine specimens of this fern, together with *Comptosorus rhizophyllus*, Link, and *Asplenium Trichomanes*, L. were found on September 22nd in a ravine near old Chelsea.

In conclusion the leaders beg to express the regret they feel that Mr. Wm. Scott has left Ottawa to reside in Toronto, knowing how much the section owes to the energetic and enthusiastic manner in which he has assisted of late years in working up the flora of the Ottawa district. They trust, however, that he may find it possible to join us in many future excursions.

R. B. WHYTE,	} <i>Leaders.</i>
JOHN CRAIG,	
R. H. COWLEY,	

#### FIRST EXCURSION, 1894.

Of the many delightful excursions held by the Ottawa Field-Naturalists' Club during the fifteen years of its active and prosperous existence, that of Saturday, May 26th, may well be awarded a first place as a typical Outing. It was not quite so large as that of last May, but in addition to the ordinary train accomodation, three special cars were required to convey the happy and enthusiastic party of Nature's students and admirers. Leaving the city at 1.30 p.m. the Chelsea station was soon reached and Vice-President Shutt announced the programme of the afternoon. The members rapidly dispersed through the adjoining fields and groves, armed with plant-boxes, insect-nets, hammers, cameras, sketch-books and other impedimenta. The Gatineau river, here flowing through a picturesque gorge in the forest-clad hills, naturally attracted a large proportion of the party, and the beautiful falls and rapids over which the swift waters madly rush, called forth many exclamations of genuine pleasure and admiration. It was an

ideal afternoon for vigorous exploration or for more leisurely sauntering, and the bright sun and clear sky formed a pleasant contrast to the gloom and dampness of the Wakefield excursion last year. The afternoon passed rapidly and pleasantly in profitable investigations of the surrounding region, and in enjoyment of the many beauties of this wild and romantic stretch of the dark, turbulent river. At 6 p.m. as previously arranged, the party reassembled at the station to hear the Leaders explain and discuss the collections of the day, or refer briefly to special features of interest in connection with the neighborhood or the several branches of investigation. Mr. Shutt, after congratulating the members and their friends upon the profitable and delightful character of the excursion, called attention to the fact that the Club was honored by the presence of Dr. Scudder, of Cambridge, U.S., Prof. Fowler, of Kingston, and Dr. McKay, of Halifax, and that these eminent gentlemen would kindly say a few words to the assembly when the Leaders had delivered their five-minute addresses. Mr. Cowley rose first as Botanical Leader and pleasantly discussed some of the plants collected, including those belonging to the lily and orchid families. He was followed by Mr. Whyte who spoke especially of the representatives of the great rose family, pointing out how unusually early the various species had flowered this season, and what favorable indications there were for a large and early fruit-crop. Prof. Fowler spoke in forcible terms of the way in which he had been impressed by the romantic and beautiful scenery, and of the great pleasure which such views of rugged hills and broken river afford to one whose time is mostly passed amid the more peaceful landscapes of a level country. Mr. Fletcher briefly stated the pleasure and advantage to be obtained from the study of his favorite butterflies, and outlined in a very interesting manner the life of these beautiful "flowers of the air." Dr. Scudder's brief speech included some humorous remarks on the methods of investigation pursued by the friendly mosquito, of which he had noted three species during the very enjoyable afternoon. Dr. Ami referred briefly to a deposit of Saxicava sands which occurred not far up the railway track, containing various marine shells, and proving that in past ages the ocean surf had thundered against the rocks of these

Laurentian hills. The hour of departure was rapidly nearing so several of the Leaders had to be omitted and Dr. McKay appropriately concluded with a very enthusiastic expression of the pleasure and profit with which he had followed the proceedings of the afternoon. The knowledge which he had thus acquired of the working methods of the Club, he hoped to utilize in connection with the natural history society which existed in Halifax. The city was reached at 8 p.m., and electric cars were in waiting to carry home the satisfied field-naturalists.—(ED.)

#### BREPHOS INFANS, MOESCHLER, AT OTTAWA.

A good specimen of this rare and beautiful moth was taken on April 12th in the firwoods behind Rideau Hall by Lady Marjorie A. Hamilton-Gordon. One had been seen at the same spot two days previously, flying high up among the trees. *B. infans* is a very showy moth; it expands over an inch and a quarter, having the upper wings of a deep mottled brown crossed by two white bands towards the tips; the under wings are bright orange-scarlet margined with black, and have also a broad black band running from the base to the anal angle from the end of which a narrow zigzag extensions runs across the middle of the wing.

The genus *Brephos* belongs to the small family BREPHIDÆ of which there are only five species catalogued from North America, three of which belong to *Brephos* and two to *Leucobrephos*. Dr. Packard says of this family as follows (Guide to the Study of Insects, p. 316):—

“In *Brephos* the hind wings are bright orange, the body is hairy and the antennæ are ciliated; the abdomen is slender, and the wings are broader than usual. The larva is smooth, elongate, with 16 legs, though the first two abdominal pairs are useless for walking; hence the larva has a semi-looping gait. It feeds on trees and makes a slight cocoon in moss or under bark. *B. infans* Moeschler inhabits Labrador and New England. It flies early in April before the snow has left the ground.”

Lady Marjorie has collected several other good insects this spring but the species mentioned above, has previously been looked for in vain by Ottawa collectors.

J. F.

## A BROOD OF FLICKERS AND HOW THEY WERE FED.

By A. G. KINGSTON.

In an article under the above title published in *The Auk* for July last Mr. Wm. Brewster, the well-known ornithologist, of Cambridge, Mass., recounts some highly interesting observations made by him on the breeding and feeding habits of a pair of these woodpeckers.

The decayed tree in which the nest had been excavated in this instance was accidentally broken off when the nestlings were about a week old, in such a way as to leave them almost entirely uncovered; and Mr. Brewster, by concealing himself not many feet away, was able to view clearly all the operations of this woodland nursery. His notes are given in minute detail. They show that in this species the young are fed by *regurgitation*.

The old bird used to visit the nest to feed the young at intervals of from twenty to sixty minutes. It was seen that no food was carried in the bill and apparently little or none in the mouth or upper throat; but looking down into the five clamorous and wide-open mouths, the parent would plunge its bill deep into the first, "as if," says the writer, "with the design of piercing its offspring to the vitals," and by a series of quick, convulsive movements, would seem to pump up the food from its own stomach and inject it into that of the young bird. And so with the next nestling and the next, until all were satisfied or the store was exhausted. The prey of the Flicker is known to consist largely of ants, together with such larvæ, &c. as inhabit dead wood; and it is apparent that by swallowing each insect as soon as captured, the bird would be able to collect, and hold securely to the end of the trip, sufficient food to supply the whole or a large portion of the family.

It is pleasing to learn that in spite of the exposure to the weather through the unroofing of their home, and in spite of the loss of the mother bird, which seems to have been destroyed about the time that Mr. Brewster began his observations, the whole five nestlings were safely reared, at least until able to fly away from sight.

Opportunities like this for studying the breeding habits of woodpeckers and other birds that breed in holes are rare indeed, but they may occur to any student of bird life. One who is lucky enough to stumble on another such chance should not fail to use diligently both eye and pencil.

## THE TRANSMUTATIONS OF NITROGEN.

BY THOS. MACFARLANE, M.E., F.R.S.C.

I am to speak to you this evening about Nitrogen. Very likely I might not have had the honor of thus addressing you had I not felt bound to try to repay your worthy Vice-President, Mr. Shutt, for the kind turn he did St. George's Church Association in lecturing to them a year or two ago on Oxygen, an equally important element, but much more energetic and meddlesome than Nitrogen. Now since Oxygen and Nitrogen may be said to be partners in many of the operations of nature, I may be said, in giving this lecture, to be paying Mr. Shutt back in his own coin. I prefer this expression and must carefully avoid referring to the transaction as an exchange of gas, for "gas" has come to be used as a figurative expression for other things besides oxygen and nitrogen : in fact, generally speaking, for eloquence of an unreliable character. Of course it is part of my task to-night to avoid eloquence of this nature and confine myself to sober and well authenticated facts.

In choosing "Nitrogen" for my subject to-night it has seemed to me that I could not do better than call attention to this more abundant, although less active and less positive constituent of the atmosphere, and trace certain of the wonderful changes which it undergoes in nature, for nitrogen, no less than oxygen, performs its rounds, and moves in stupendous cycles through the inorganic, the animal and the vegetable worlds. Not unfrequently, these changes are so mysterious, and their results so strange and inexplicable that I have ventured to characterise them as transmutations. This term, as you well know, is applied to the supposed process in which the old alchemists believed, by which one metal was supposed to be actually converted into another ; and more especially base metals changed into gold. Conversions almost as miraculous, transformations almost as astonishing are produced in the properties of the compounds into whose composition nitrogen is introduced. That element assists by turns in building up an atmosphere, a food, a poison, a colour, the bloom of a flower, the fibres of a muscle, the feathers of a fowl, the force of an explosive. We may therefore truly speak of its transmutations.

But what is Nitrogen? A simple body, colorless, tasteless, in-odorous, as the chemical text books tell us. And they used also to say that it was always gaseous when uncombined. So it is at ordinary temperatures, but it can be frozen at  $346^{\circ}$  below zero Fahrenheit when under enormous pressure. Then it becomes, according to Professor Dewar, a white crystalline substance. His apparatus for producing it cost something like £5000 and cannot very well be reproduced here. But although we cannot have the solid nitrogen we have plenty of the gas. When the ladies use their fans it is mainly to put nitrogen in motion. It is the sleeping partner of oxygen in carrying on the business of the atmosphere. It is a mysterious element, fickle, indifferent and unstable, but it is most abundant and constitutes four-fifths of the ocean of air at the bottom of which we live, move and have our being. The experiment which demonstrates this is very old, but like a good story is none the worse of being twice repeated.

All the interesting positive properties of the atmosphere are due to oxygen. Nitrogen is only present as a diluent, a restraint, a drag. It is mixed with the oxygen in a mechanical sort of way to prevent its doing too much damage, like water in whiskey. There is no intimate chemical combination betwixt the gases of the atmosphere. In fact nitrogen does not combine willingly with the other elements and is always ready to part company with them at very short notice.

The question "What is nitrogen?" can, however, be asked and answered with the same significance as the enquiry "What is butter to-day?" when asked by purchasers at the market. Nitrogen has its price like butter, and in fact the latter is sometimes sold at no higher price per pound. Here we have three jars containing respectively dried blood, sulphate of ammonia, nitrate of soda; all articles of commerce and used in Canada chiefly as fertilisers. All contain nitrogen, although in different combinations, and in all of them the nitrogen is worth about 16 cents per pound. Inside of these bottles then its value is considerable; outside of them, in the atmosphere, it is valueless. Inside the bottles it is combined, outside it is free; free as air and as cheap. But just fancy how rich we should all be if this free nitrogen could be fixed and realized in the form of money. Fifteen pounds of air press upon

every square inch of the earth's surface ; that contains 12 lbs. of nitrogen at 16c. ; very nearly \$2 per square inch or \$288 per square foot. If we calculate at these rates the value of the atmospheric nitrogen resting upon a square acre it amounts to twelve and a half million dollars and on a farm of 100 acres one thousand two hundred and fifty millions. It would be quite interesting if we were to give a history of the attempts that have been made to realize or fix this nitrogen and get it into the form of ammonia, nitric acid or cyanogen. But the chemists have all failed to do this economically and the only person who has it in his power to utilize it to a certain extent is that humble individual the farmer.

For nearly a century and a quarter the question of the utilisation of nitrogen by plants has been a subject of controversy among scientific men. It was the famous Priestly who began it in 1771. He and, a few year's later, Ingenhous pointed out that plants are able to assimilate very appreciable quantities of nitrogen from the air. Saussure denied this, so did Woodhouse and Sennebiér, all of them basing their conclusions upon experiment. The famous Liebig also wrote on the same sides. Then the question slept until 1851 when Boussingault renewed the controversy and both he and George Ville from their experiments maintained the affirmative side of the discussion. A commission of the Academy of Paris took their side, but later Cloëz, Mène, Hartung and Gunning came to an opposite conclusion. In 1861 Lawes, Gilbert and Pugh ranged themselves on the negative side, but Bretschneider two years later made experiments with lupins and dwarf bean plants obtaining most positive proof of the assimilation of atmospheric nitrogen. Perhaps the conflicting conclusions previously arrived at had been owing to a want of sufficient care in the observations made on different sort of plants. In any case Bretschneider's results only confirmed what was known about the cultivation of the papilionaceæ away back in the time of the Romans. W. Strecker has disinterred a passage in Pliny (Natural History: Book XVIII.) of which this is a translation ; "Lupins, Lentils or Pulse require so little manure that they in fact replace it; Vetches make the land fertile. Corn should be sown where previously lupins, vetches or beans have stood, because these only make the land more

fertile." Here we have the experience of antiquity agreeing with the practice of the modern intelligent farmer who ploughs clover into the ground in order to obtain a good crop of wheat.

From 1863, experiments and disputations on the question again ceased until 1881, when an intelligent land owner in North Germany, named Schultz, published his experiences in farming, and awakened the attention of the agricultural world of Europe. Both practical farmers and scientific agriculturists are now fully agreed that the fixation of nitrogen by leguminous plants is a reality. The most decided pronouncements ever made on the subject were delivered at Halle, in January, in 1891, at the 64th meeting of German investigators and physicians. Prominent among those were Maercker, Wagner and Hellriegel, but American and English authorities were also present including Atwater, Lawes and Gilbert. The last named gentleman, Sir Henry Gilbert, who visited Canada a few months ago, gave a discourse on the fixation of free nitrogen from atmospheric air by plants. He had presided in 1886 at Berlin, when Hellriegel gave the results of his first investigations regarding the question of nitrogen and the leguminosæ. Previously, in 1884, Hellriegel had brought the formation of the little bulbs on the roots into connection with the fixation of nitrogen. Sir Henry Gilbert told his audience that at Rothamsted, since 1888, elaborated trials on this subject had been carried on, the characters of which were illustrated photographically. Those experiments entirely confirmed Hellriegel's results. They shewed that peas, vetches, lupins, lucerne, white and red clover, are all capable of directly assimilating nitrogen, although in different measure. The lecturer discussed minutely the nature and action of the tubercles, without however coming to very decided results as regards their mode of activity. Some of them are as large as walnuts, and the investigators are still inclined to believe that the bacteria they contain are instrumental in digesting the nitrogen. Hellriegel was of opinion that the study of these tubercles was far from ended, and would occupy them a long time yet. He stated that peas are unable to appropriate either nitric acid or ammonia from the soil; that lupins cannot thrive when supplied with nitrate of lime, but perhaps with nitrate of ammonia. Meyer was glad to be able to observe that although Hellriegel's investigations had overtaken and

passed those of Rothamsted, the work was being continued in the friendliest manner, and utterly free from envy and dispute.

From these memoranda regarding this great meeting of agricultural scientists at Halle, it will be seen that the fixation of atmospheric nitrogen by plants of the sub-order papilionaceæ, is now established beyond all possibility of doubt, and that that farmer will be the truest artist and become the richest man who makes the best use of these well established results of scientific investigation in agriculture.

But although it is a fact that these humble leguminous plants are so highly gifted by nature, it is equally certain that the cereals and other plants of a higher order cannot appropriate nitrogen in this direct way. They and their rootlets must search for it in the soil in the form of nitric acid, which may have been brought from the atmosphere into the soil or have originally existed as nitrogen in its organic matter or humus, or may have been produced by the oxidation of ammonia. Decayed vegetable matter, peat and black muck contain quantities of nitrogen varying from  $\frac{1}{4}$  to 2 per cent. in the air dried condition. When this is composted or mixed with other soil and stable yard manure the nitrogen is gradually made available for plant food; in fact it undergoes a process of oxidation, being first changed into ammonia and then if bases are present into nitric acid. This lecture would certainly be incomplete without some notice of these important compounds. We shall now make some reference to ammonia; later on to nitric acid.

(Here experiments were introduced illustrative of the great solubility and alkaline character of ammoniacal gas; the formation of ammonium chloride and the oxidation of ammonia in the ignition of the bichromate.)

But it is our business this evening to go further and ask what use the plant makes of the nitrogen which it appropriates. It is immaterial whether we suppose that the nitrogen is assimilated as such or as ammonia or as nitric acid, in any case the use which is made of it by plants, and the wonderful products into which it is transformed by the vital activities at work in these, are simply miraculous. A very high authority, Mr. Warington, a colleague of Sir Henry Gilbert and Sir

John Lawes in the investigation at Rothamsted thus expressed himself on this wonderful peculiarity of the vegetable world :—"The immense variety of substances produced in the vegetable kingdom has always been a source of astonishment to the chemist. The plant is indeed the finest chemical laboratory with which we are acquainted. While some kinds of chemical work are common to all plants, there is hardly a species which does not possess some special capabilities, which does not produce some products different from its neighbors. When we survey the whole vegetable kingdom, the extent to which this specialisation is carried, and the immense variety of the products obtained become simply overwhelming. Chemists are still unacquainted with the larger part of the substances produced by plants. When we turn from the products of plant work to the materials employed our wonder still increases, for these materials are of the simplest kind—water, carbonic acid, oxygen, nitric acid and a few inorganic salts—yet out of these the whole of the immense variety of vegetable products is constructed."

In the interesting lecture by Mr. Shutt to which I have already referred, he traced the travels of oxygen and the manner in which that element carries carbon to the vegetable kingdom, and assists in storing it up in plants in the form of carbohydrates, such as starch and sugar and cellulose. These substances are, however, quite destitute of nitrogen, and we cannot say much about them now. We are tracing now the fortunes of nitrogen, and that element occupies itself in the plant in building up an entirely different set of compounds from the carbohydrates, namely, the albumenoids, or as Beilstein calls them the albuminates, or as Mulder christened them the proteids. In casting round for the word which indicates popularly those of them which occur in the vegetable world, I should be inclined to fix on the word gluten, but that substance is only a mixture of insoluble albumenoids, and it is doubtful as to whether it exists in the original grain.

No doubt this general name of albumenoids has been conferred upon all these bodies from the resemblance they bear in some of their properties and always in chemical composition to ovalbumen or white of egg. This substance is soluble in water in its natural state and coagulates on heating.

The albumenoids, whether of vegetable or animal origin have been characterised as "infusible, non-volatile amorphous solids, neutral in re-action and indifferent in combination." Thus it seems that their characterising element nitrogen has been able to impress its own individuality upon them, and the most characteristic chemical re-action they can show in one indicating the presence of nitrogen. When they are well dried and heated with soda lime, or even alone, they give off ammonia, which can be recognised by smell and reaction. There is always produced a disagreeable smell on burning nitrogenous substances (wool); not so when nitrogen is absent; (cotton).

The composition of animal and vegetable albumenoids is very nearly the same, and their chemical properties very similar. It is not usual to recognise the properties of white of egg in vegetable products, but it can be shown that a similar substance may be obtained from wheaten flour. On shaking some of it up with cold water, and filtering, a solution is obtained which coagulates on heating, on admixture with dilute acids, alcohol, &c.

The precipitate produced when the cold solution from wheat flour is heated is called plant albumen, but if this be filtered off and a little acid added to the filtrate we obtain a separation of what is called legumin or vegetable casein. This sort of casein is the chief albumenoid formed in the leguminosæ, in peas and beans, in their little laboratories, whenever they undertake, as is their proud privilege, to utilise the nitrogen of the atmosphere.

But the proteids which the cellular tissue of a plant manufactures from its nitrogenous food are not all soluble in water. In fact, however soluble they may be in the plant itself, comparatively little of them in quantity is found to be so after we get them into our hands. If we make a little dough from wheaten flour and knead it enclosed in a piece of calico, either in water, or with occasional immersion, the starch of the flour exudes through the small holes in the cloth, along with the soluble proteids. If this kneading is continued until no more white particles can be kneaded out, and the cloth is then opened there is found inside a grey coloured, elastic, sticky substance, which is known as "crude gluten." Its stickiness is characteristic; the Germans call it "kleber,"

from the verb kleben, to stick. "It is the presence of gluten in wheaten flour that imparts to it its viscosity or tenacity, and confers upon it its peculiar excellence for the manufacture of macaroni, vermicelli and similar pastes. The superiority of wheaten over other bread, depends upon the greater tenacity and elasticity of its dough and this is owing to the presence of the "gluten" we are speaking of. The dough during the fermentation and baking is puffed up by the evolved carbonic acid, and so stretched out as to produce the vesicular texture, so much valued in the light loaf."

This gluten is eminently nutritious, because it consists of albumenoids, which though insoluble in water, are easily acted on by the digesting fluids. It is not, however, a simple chemical compound but consists very largely of gluten fibrin. That it is highly nitrogenous may be proved by applying the same test as in the case of the white of egg.

The percentage composition of gluten fibrin I shall write down alongside of the other albumenoids, so that you may see how very little they vary from one another.

#### PERCENTAGE COMPOSITION.

		C.	H.	N.	S.	O &c.
Proteids (Vegetable)	Plant Albumen (from wheat)	53.10	7.20	17.60	1.60	20.50
	Legumin (peas)	51.50	7.00	16.80	0.40	24.30
	Gluten Fibrin (wheat)	54.30	7.20	16.90	1.00	20.00
Albumenoids (Animal)	Ovalbumen	52.5	6.9	15.25	1.93	23.42
	Casein	53.6	7.1	15.70	1.00	22.60
	Fibrin of blood	53.4	7.0	18.10	1.20	21.30

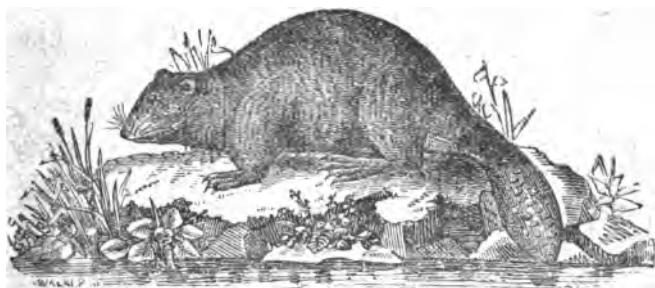
General Molecular Formula    72.    112.            18.    1.            22

We shall recognize more fully the great importance of these vegetable albumenoids, or proteids as I prefer to call them, when we come to consider later on those of the animal kingdom. Meanwhile what we have again to point out is that these bodies so complicated in their composition and so curious in their properties, are built up in the interior of plants from such inorganic materials as nitrogen, ammonia and nitric acid by the agency of no other apparatus than those tissues

July, 1894.

THE  
\* OTTAWA NATURALIST \*

VOLUME VIII. No. 4.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued June 30th, 1894.

Published Monthly at \$1.00 per annum.

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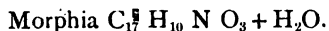
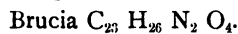
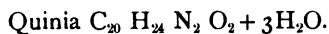
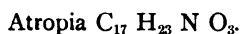
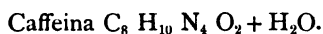
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ELLS, R. W. Asbestos ; its history, mode of occurrence and  
uses. pp. 24, 10c.

and cells we see when plants are microscopically and even macroscopically examined. In the infancy of chemical science it was customary to call in the aid of the vital principle in further explanation. It seems that we have now got beyond that; "nous avons changé tout cela" as the French say. I shall have, however, something more to say about this point before I close this lecture.

But those albuminoids are not the only compounds which plants are capable of forming with such inorganic nitrogen; many very wonderful compounds of different nature are stowed away in the root, stems, leaves and seeds of plants and trees which have nitrogen for an essential constituent. They are known as the alkaloids so much used in medicine. Although the plants and trees which yield the alkaloids grow in localities wide apart, at different altitudes, on soils of varying composition, and although they frequently come from very different parts of the plant, from the roots, the stem, the bark, the sap, the leaves and the seed, yet the fact that plants cannot elaborate these curious and valuable and dangerous substances without nitrogen, ammonia or nitric acid is common to them all. Among them are *caffaina*, which in tea, coffee and cocoa cheers, but not inebriates; *quinia*, the great fever remedy, from the bark of shrubs and trees of the tribe *cinchonaceæ* growing on the west slope of the Andes; *morphia*, from poppy juice, well known for its sedative powers and regarding which it has been remarked that by its judicious employment more happiness and by its abuse more misery has been produced than by any other drug used by mankind. *Aconitia*, mostly used in the anodyne liniment, seems to be to the human body outwardly what *morphia* is internally, a soother of pain. But it as well as *atropia*, *brucia* and *strychnia* are also known as the most powerful poisons. They are in appearance very innocent individuals, but they are terribly dangerous at close quarters.

The following formulæ show the composition of some of these bodies:—



We must not however go farther afield in noticing these products of the transmutation of nitrogen. Il faut que nous revenons a nos moutons ; we must return to our mutton or rather to the substances which make our mutton, for it must not be forgotten that proteids are also to be found in the grassy plants. This has been fully shown by Mr. Shutt in his reports and he has even proved that "the percentage of albuminoids is higher in a grass before flowering or when in flower than when the seed is fully formed." He tells us that, "as the seed matures there is a migration of the albuminoids of the leaf and stalk into the seed," a very interesting fact and only less wonderful than the first formation of these important substances.

Valuable and important substances they are indeed, for the researches of Liebig went to prove, nearly fifty years ago, that these albuminous compounds are formed in the vegetable kingdom alone ; that the animal body possesses only the power of appropriating them and converting the one into the other. Animals are entirely dependant on vegetables for a supply of the substances out of which first blood, and then from that fluid all the solids of the body are produced. For this reason the food of animals must contain these albumenoids ready formed.

This is not the first time you have been told that "All flesh is grass," but that has been to you for the most part a figurative expression. It is, however, true in a very literal sense. Flesh, that is to say, the fibrin of the muscles, the insoluble albuminoid of the animal kingdom is derived from the albuminoids of grass, vegetables, cereals, and leguminous plants. With these we follow the fortunes of Nitrogen from the vegetable into the animal kingdom. The great mass of the dry organic constituents of the animal tissues consists of these amorphous, nitrogenous, complicated substances of high molecular weight, and it is very well worthy of remark, that although the carbo-hydrates, starch, sugar, and even cellulose, play a most important part in animal nutrition and economy, they do not form part of what may be called the permanent constituents of the bodies of animals. Take for instance the body of a man of 11 stone or 154 lbs. ; it has been estimated that

111 lbs. or more than two thirds, consist of water. The remaining 43 lbs. consist of the following proximate constituents :—

	lbs.	oz.
Phosphate and carbonate of lime with fluoride of calcium forming the earthy matter of the bones.....	7	..
Other phosphates and carbonates with chlorides, sulphates, silica, and iron oxide.....	..	9
Fat, constituting the adipose tissue.....	12	..
Gelatine, of which the walls of the cells and many tissues of the body, as well as of skin and bones are composed.....	15	..
Albumen found in the blood and nerves.....	4	3
Fibrin forming the muscles, the clot and globules of the blood.....	4	4
Total.....	43.	0.

Thus out of 43 lbs. dry substances 23.7 are albuminoids, but taking the dry organic constituents alone, 23.7 lbs. in 34.7 lbs., or 66 per cent., consist of the nitrogenous constituents of which we have been speaking. The carbohydrates so far as they have contributed to the building up of the body are represented by the fat.

According to Hammarsten it has become customary to include the whole of the animal albuminoids under the name of proteines or proteids, which would seem to be rather an unfortunate arrangement. It is unnecessary to go so far back as to explain how and why this term was invented by Mulder for designating all these nitrogenous substances, but since it comes from a Greek word signifying "I am the first" it would appear more appropriate to apply it rather to the vegetable albuminoids and confine it to them only.

It will scarcely be expected that I should give in such a lecture as this a full description of the processes of digestion and assimilation, but it is our business to attempt to follow the proteids of the vegetable kingdom in the changes which they undergo in passing through the animal economy. We must leave almost unnoticed the fat and the

carbo-hydrates of food, and follow the proteids into the animal stomach where it is the special function of the pepsin contained in the gastric juice to render them soluble.

A word or two may not be out of place here regarding the digestive ferments. These are all nitrogenous bodies as is also the diastase of malt ; but they are unorganised ferments or enzymes. They are quite different from the organized ferments, the vegetable or animal growths such as *Saccharomyces cerevisia*, which are said to provoke the various kinds of fermentations. Perhaps a good way to classify them would be to call the former ferments and the latter "varmints."

It does not appear that the digestive fluids of the intestinal canal such as the bile and pancreatic juice, are much concerned in acting upon the albuminoids of food or rather the peptones of the chyle. Their functions seem to be rather to convert sugar and fat into a condition for easy absorption. Elaboration follows absorption and ultimately these nutritive materials become part of the blood which conveys them to every part of the body, and affords to every organ and tissue a supply of the substances they stand in need of. Thus the nitrogen we have been following becomes part of the albuminoids of the blood, muscles and nervous system, and to its functions and transformations in connection with these I have now to invite your attention.

The blood, which constitutes about one twelfth of the weight of the body, and consists of the slightly yellowish colored fluid called the plasma or serum, and the blood corpuscles which swim around in it, is the fluid of life. It not only conducts to the various tissues and organs the substances which are necessary to their sustentation and growth, together with the oxygen required for changing the condition of the waste which they sustain, but it also takes up and removes from them all the substances which have served their purpose and become waste, in order to conduct them to the various organs of removal, the lungs, the skin and the kidneys, through which they obtain egress from the animal body. Formerly it was supposed that the various combinations and decompositions necessary to those operations took place in the blood itself. This view has, however, long since been recognized as erroneous, for none of the products of such decompositions are ever

found in the arterial blood. Chyle, lymph and blood are simply to be regarded as the means by which the transportation is effected of the decomposable and decomposed material; the decomposition or change itself is effected in the tissues. The various substances dissolved or suspended in the arterial blood, such as albuminoids, fat, sugar, salts and oxygen diffuse themselves through the fine capillaries of the blood vessels into the fluids of the tissues and here it is that they are subjected to all sorts of changes and transformations. The products of these are gathered up into the dark venous blood, which carries them away to be discharged from the body, while another set of fine tubes, the lymphatic absorbents, pick up all healthy superfluous fluid from the various tissues and return it into the circulation.

The albuminous substances thus spread all over the system are split up into more and more simply organised bodies, the final products being urea and uric acid. Just how this transformation is effected is far from being clearly understood. But there is not the slightest doubt about the fact that the substance urea, which contains nearly 50 per cent. of nitrogen, together with small quantities of uric acid and ammonia, is the ultimate product of the decomposition of the albuminoids in the animal organism, and is completely removed from the body by the instrumentality of the kidneys. Consequently the quantity of urea produced in the animal body furnishes a measure of the quantities of albuminoids consumed. The nitrogen of 100 parts of albuminoids is capable of producing 33.45 parts of urea and if the constituents of the latter are subtracted from the albuminoids thus :

	C.	H.	N.	O.
In 100 pts albuminoids . . . .	53.53	7.06	15.61	23.80
In 33.45 urea . . . . .	6.69	2.23	15.61	8.92

There remain . . . . .	46.84	4.83	....	14.88
------------------------	-------	------	------	-------

which are applied either direct to sustain the animal heat or are deposited in the body as fat. Thus, while the carbon, to a very large extent, of the albuminoids in common with that of the carbo-hydrates either promotes the production of fat or finds its way in the shape of carbonic acid to the lungs, and is so discharged into the atmosphere, a very different fate is experienced by the nitrogen. In some mysterious

way, in a manner not yet understood by physiological chemists, it is made to form part of this substance urea and in the form of that compound it is separated from the body.

A very pertinent question, and one of the greatest importance is this : What is the special function of nitrogen in the animal economy ? To what purpose is this continuous stream of it which passes through the body ? Why are the albuminoids so essential to life, apart altogether from their carbon which goes partly to sustain the animal heat ? Liebig's theory is well known and it is probably the one which to-day, in spite of its defects, finds widest acceptance. It is simply this : The conversion of part of the substance of the muscles into urea produces the power which the muscles require in performing movement and work. The nitrogen which is discharged from the body is therefore the equivalent of the transformed fibre, and therefore of the developed power and of the accomplished work. But there have been many objections to this teaching. It has been maintained that the muscles do not form the material by the chemical transformation of which power is produced, but only the apparatus in which the change is effected. Voit showed that, although the supply of albuminoids to an animal might remain unchanged, the mechanical work performed by that animal might be increased at pleasure, and that without provoking any increase in the amount of nitrogen discharged. Lawes and Gilbert too proved that this quantity depended entirely upon the nitrogen contents of the food, and therefore that the consumption of the muscle substances was entirely independent of the work accomplished. But since the muscular power must have come from the nourishment some opponents of Liebig's theory have sought its cause in the combustion of the non-nitrogenous nutrients, and they feel themselves the more justified in doing this because Smith, Von Pettenkofer and Voit had established beyond doubt the fact that, with the increase of muscular activity, the quantity of carbonic acid exhaled from the lungs increased also. In 1870 Liebig admitted the defects of his first theory and and brought forward a revision or modification of it. He felt himself, however, obliged to admit that even his new explanations were not entirely satisfactory, and declared that the true theory of the origin of muscular power had not yet been discovered and could only be

expected from the far distant scientific investigations of the future. Here then we find ourselves face to face with one of the many questions to which scientists must answer, We don't know yet. Perhaps the activity and functions of nitrogen may by and by be located elsewhere in the body, and it is not impossible that it may have a closer connection with the nervous system than is now generally supposed. But what we are now quite certain of is that comparatively little of the nitrogenous substances or proteids of the vegetable kingdom remain permanently in the bodies of animals. A much larger quantity, or rather of their nitrogen, is made use of in simply sustaining the vital processes. Of the albuminoids thus consumed, say by the live stock on a farm, their carbon finds its way to the lungs in the shape of carbonic acid and their nitrogen is expelled chiefly in the liquid manure of the animals. This is a fact not yet sufficiently appreciated by our agriculturists generally, and much of the nitrogen thus expelled finds its way back to the atmosphere. When it is properly cared for by the farmer it does, or should, not escape from the soil of his fields. Our nitrogen thus travels back to soil or atmosphere after having completed its life-giving circulation through the vegetable and animal kingdom. If it is allowed to reach the atmosphere then the agency of the leguminosæ is required to recapture it. If it again becomes a part of mother earth it is pretty securely held and is subject to some changes which we have now to consider.

Animal matter containing nitrogen, when it finds itself in a soil which is destitute of bases such as potash, soda or lime, usually gives rise to the formation of ammonia, but when bases are also present further oxidation takes place to nitric acid with simultaneous formation of nitrates such as saltpetre. It was this fact which caused Chaptal to suggest nitrogen as a name for that element from words signifying "I give rise to nitre."

(Here the following experiments were introduced and explanations given ; combustion of phosphorus and carbon in nitrous oxide ; oxidation of nitric oxide to nitrogen tetroxide ; production of nitric acid from saltpetre. The lecturer also referred to the oxidation of nitrogen in the soil, and the manufacture of nitre in the the East Indies.)

The instability of the compounds of nitrogen has been referred to,

and although we can point to some animal substances of a very permanent character which contain nitrogen, nevertheless I am afraid we must admit that on the whole the subject of our lecture is a fickle and unreliable element. It is a constituent of almost every explosive, and these owe their effectiveness to the ease with which nitrogen and its associates part company and resolve themselves into gases, the sudden production and expansion of which fractures and ruins their environment, whatever that may be, unless properly confined or regulated. The chief raw material for the old explosive gunpowder was, as you know, saltpetre, but now, for the high explosives so-called, nitric acid is employed. The aim of the manufacturers of these new explosives, whose name is legion, is to get rid of all unnecessary constituents and employ only such, as will resolve themselves completely into gas, and as much of that as can be produced. In place of sulphur and charcoal used of old in making gunpowder, cotton and various forms of cellulose, glycerine and even sugar have been substituted and nitrified or nitrised by nitric acid. In this way gun-cotton is produced as well as nitroglycerine. The latter substance is composed of  $C_2 H_5 N_3 O_9$  and when exploded 2 molecules of it yield 6 of carbonic acid, 5 of water, 1 of nitrous oxide and 4 of nitrogen, one part by bulk will yield on combustion.

554	volumes of aqueous vapour
469	“ carbonic acid
39	“ oxygen
236	“ nitrogen

---

1298 volumes in all.

But M. Noble tells us that the heat set free by explosion causes the gases to expand to eight times their bulk ; so that one volume of nitroglycerine will yield 10,384 volumes of gas while one part by bulk of ordinary gunpowder yields only 800 volumes. Noble was not the discoverer of nitroglycerine. The first inventor was Sobrero, in 1847 while a student in the laboratory of Pelonze at Paris. Noble began its manufacture 15 years afterwards in 1862. From that sleep of 15 years it has awakened with such violence as almost to make people wish it had never been invented.

*(Continued on page 69.)*

POPULAR *vs.* SCIENTIFIC ORNITHOLOGY.

By A. G. Kingston.

As a sequel to my note on page 44 the following correspondence in succeeding issues of *The Auk* is worth reproducing :—

Mr. Wm. Brewster, writing in the October number, says :

“ In an article which appeared in the July number of *The Auk* I described at some length a peculiar process of regurgitation employed by the Flicker in feeding its young, believing and indeed remarking at the time—that the habit was unknown or at least unrecorded. It seems, however, that it had been previously observed by Mrs. Olive Thorne Miller, who published an account of it in 1890 in the *Atlantic Monthly*, the article being afterwards (in 1892) republished in a collection of essays entitled ‘ Little Brothers of the Air.’

“ It is a pity that writers like Mrs. Miller—gifted with rare powers of observation and blessed with abundant opportunities for exercising them—cannot be induced to record at least the more important of their discoveries in some accredited scientific journal, instead of scattering them broadcast over the pages of popular magazines or newspapers, or ambushing them in books with titles such as that just quoted.”

And Mrs. Olive Thorne Miller, in the January number, replies :

“ Mr. Brewster’s gentle admonition in *The Auk* of October last seems to call for an explanation of my position. The reasons I turn more readily to a literary than to a scientific channel of expression are several, not to speak of the fact that I am naturally of literary rather than scientific proclivities. There is first my great desire to bring into the lives of others the delights to be found in the study of nature, which necessitates the using of an unscientific publication and a title that shall attract, even though it may, in a measure, ambush my subject.

“ Again, never having studied scientific ornithology, and having no time at present, if I had the wish to do so, and moreover, having an intense love of live birds, and an almost Buddhistic horror of having them killed, I must admit of feeling the least bit out of my element

"among those who—to put it mildly—feel otherwise. Let those who  
 "will spend their days killing, dissecting and classifying ; I chose rather  
 "to give my time to the study of life, and to doing my small best toward  
 "preserving the tribes of the air from the utter extinction with which  
 "they are threatened. \* \* \* \* "

## ROYAL SOCIETY OF CANADA.

The thirteenth annual Meeting opened in the Convocation Hall of the Normal School on Tuesday, 22nd May. Dr. G. M. Dawson, President, occupied the chair, and a large number of the Fellows were in attendance, with numerous ladies and gentlemen also interested in literature and science. Their Excellencies the Governor General and the Countess of Aberdeen were present, and an address of welcome was read by the President. His Excellency responded in appropriate terms, and warmly congratulated the society on the success which had accompanied its labours. The voluminous Report of the Council was then read by the Hon.-Sec., Dr. Bourinot, after which the sections organized and proceeded to the reading and discussion of papers.

In the evening Dr. Dawson delivered his President's address, the chair being taken by the Hon.-President, His Excellency the Governor General. The large audience included Lady Aberdeen and many distinguished persons, who greatly appreciated the President's able address upon "The Progress and Trend of Scientific Investigations in Canada," which gave a comprehensive survey of the work conducted by various departments of the government, and by the leading scientific societies. On the conclusion of the address His Excellency made some eulogistic remarks, and tendered to the learned lecturer the thanks of the audience. Many of those present then attended a delightful reception given by Mrs. Bourinot in her charming house on Cooper Street.

Wednesday was devoted entirely to the reading of papers in the sections ; an adjournment being made at 5 p.m., so that the members might attend an "At Home" given by Dr. Sandford Fleming. A very interesting public meeting was held in the evening by the French Literature Section : the programme including a lecture by the Hon. Mr. Marchand, M.L.A., of Quebec, entitled "Un Tour de France durant la Seconde République."

Thursday was made, in honour of Her Majesty the Queen, a day of rest and recreation. During the forenoon a large party visited the Central Experimental Farm, and were conducted over the grounds by the Director and his staff, who fully explained the many interesting experiments in progress in the several departments. A Luncheon and Garden Party at Government House, to the members and delegates, was given by Their Excellencies, whose delightful hospitality was greatly enjoyed. The society sent through His Excellency a cable message of congratulation to Her Majesty, Queen Victoria, to which a gracious reply was promptly transmitted.

Friday morning was occupied by the sections in completing their work and electing their officers, and in the afternoon a general meeting of the society was held, at which the reports of the sections were received, several Fellows elected, and various important matters discussed. The meeting was closed by the election of the following officers for the present year :—President, Mr. J. M. LeMoine, Quebec ; Vice-President, Dr. Selwyn ; Hon.-Sec., Dr. Bourinot ; Hon.-Treas., Mr. Fletcher.

An eloquent and forcible lecture was delivered in the evening by Prof. B. E. Fernow, Chief of the Division of Forestry, U. S. Dept. of Agriculture, Washington, his subject being the "Battle of the forest." He graphically portrayed, first the long fight for the possession of the earth's surface and the formation of soil ; next the conflicts of the various species and the struggle for the most favorable habitats ; finally, the defeat by man, and the destruction of the more valuable forms. With axe and fire, not only the forest is removed, but often the very soil which it had taken so many ages to accumulate and prepare. The interest of the lecture was much enhanced by numerous beautiful illustrations. This address, read in conjunction with that of Prof. Macoun should impress upon all thoughtful persons the necessity for a more comprehensive and rational system of using our forests.

The success of this meeting of the society was contributed to by the following distinguished scientists from the United States, (who were present by invitation), Prof. O. C. Marsh, Dr. S. Scudder and Prof. B. E. Fernow. Rt. Hon. James Brice (London Eng.), Sir James Hector (Wellington, N. Z.), and Dr. S. H. Scudder (Washington U.S.), were

elected Corresponding Members, and the following gentlemen were elected Fellows :—Sec. I, Adolphe Poisson (Arthabaskaville); Sec. II, Wilfred W. Campbell (Ottawa), Arthur Harvey (Toronto), Dr. J. A. McCabe (Ottawa), Lt. Gov. J. C. Schultz (Winnipeg); Sec. III, Rev. Dr. Williamson (Kingston); Sec. IV, G. U. Hay (St. John N. B.), W. H. Harrington (Ottawa), and Rev. G. W. Taylor (Victoria B.C.). Wm. Kirby (Niagara), and Ewan McColl (Toronto), of Sec. II, were created Retired Members. Sections II and IV have now their full quota of members, there is one vacancy in Sec. I, and four in Sec. III.

Some sixty papers were read before the sections, many of which were extensive contributions to literature and science. In section III, a paper was read by Mr. Shutt, entitled "Some observations on the quality of the air of Ottawa," but the papers read in section IV were naturally of most interest to the members of the Ottawa Field-Naturalists' Club. Prof. Macoun's Presidential address was a very valuable paper on "The Forests of the Dominion and their Distribution." It is regretted that for want of space not even the titles of the other papers can be given. The Section elected the following officers for the current year: President, Mr. James Fletcher; Vice-Pres., Prof. Wesley Mills; Secretary, Prof. Penhallow. [Ed.]

### BOOK NOTICES.

ON CYPHORNIS, AN EXTINCT GENUS OF BIRDS.—BY E. D. COPE.

JOURNAL A. N. S. PHILADELPHIA, VOL. IX, pp. 449—452, PLATE XX.

To our knowledge of the extinct vertebrates of Canada, Prof. E. D. Cope contributes an interesting chapter in the last fascicle issued by the Journal of the Academy of Natural Sciences, Philadelphia. The paper is based on a specimen collected by Dr. George M. Dawson, from the Tertiary Shales of the west coast of Vancouver Island and belongs to the Geological Survey of Canada.

Elaborate descriptions and measurements of this specimen are given on pages 449 *et seq.*, and it is said to consist of the "superior part of a tarsometatarsus," belonging to an extinct genus of bird. It was a rather singular but fortunate occurrence that this portion of the skeleton of this bird was preserved and discovered, inasmuch as "the tarso-

metatarsus is perhaps the most characteristic part of the skeleton of a bird." Prof. Cope finds that this extinct species of bird, which used to inhabit our western coast in Tertiary times, and to which he has given the generic designation of *Cyphornis*, bears greater resemblance to the steganopodes or pelicans, than to any other family. "The anterior aspect of the bone," Cope says, (*loc. cit.* p. 451), "is almost exactly like that of *Pelecanus*, but the posterior aspect resembles that of none of the order in the absence of the tendinous groove." When compared with cretaceous birds, Prof. Cope finds but "one point of resemblance" and that with the extinct form *Hesperornis*, viz: in "the ridge-like elevation of the anterior part of the external tibial facet, which is in both genera connected with the intercondylar tuberosity." The affinities of this bird, Prof. Cope holds, "are more clearly with the *Steganopodes*, combined with affinities to more primitive birds, and having a simple hypotarsal structure." *Cyphornis magnus*, Cope, is the name ascribed to this extinct bird, which in Tertiary times—at a period probably intermediate between the Eocene and Oligocene—frequented the shores of Vancouver Island.

"As regards its habits, it may be said that the pneumatic character of its foot bone renders it improbable that it depended on this member for habitual locomotion on land. In all the birds of terrestrial habit which I have examined," he continues, "and of which I can give information the tarsometatarsus is either filled with cancellous tissue, dense or open, or the walls of the shaft are thick as in the Emu. The presumed affinity with the *Steganopodes* indicates natatory habits and probable capacity for flight. Should this power have been developed in *Cyphornis magnus*, it will have been much the largest bird of flight thus far known."

On plate XX, which accompanies the text of this fascicle, Prof. Cope figures four aspects of this bone and in the latter expresses the hope that additional material will be forthcoming from which to make more detailed and more perfect descriptions of this extinct bird.

H. M. AMI.

## FAUNA OTTAWAENSIS.

## HEMIPTERA.

By W. Hague Harrington, F.R.S.C.

Since the publication, in June 1892, of the list of Ottawa Hemiptera (Ottawa NATURALIST, Vol. VI, page 25), the following additional species have been collected, and have been kindly identified by Mr. E. P. Van Duzee. Unless otherwise stated, only single specimens have been observed.

## HETEROPTERA.

*Corimelæna nitiduloides*, *Wolff*. April 15th.

*Euchistus ictericus*, *Linn*. June 3rd 1893, Mer Bleue. May 25th and June 10th, 1894, Hull.

*Phytocoris tibialis*, *Reut*. Apparently common. July.

*Neurocolpus nubilus*, *Say*. July 29th.

*Lygus pabulinus*, *Linn*. July.

*Diplodus socius*, *Uhler*. July 30th. On Solidago, near Hull. This species is recorded from the Western States, and Mr. Van Duzee expresses his surprise at its occurrence at Ottawa. He asks "did it not come from British Columbia?" As it was captured not many hundred yards from the main line of the famous C.P.R., it may possibly have stolen a ride across the continent upon some train.

*Limnotrechus marginatus*, *Say*. Sept 3rd. Both sexes (and young apparently of same species) abundant in the canal. Probably the common species of all our waters.

*Rhagovelia obesa*, *Uhler*. Nov. 3rd. Both sexes abundant in Rideau River, above the railway bridge, near Hog's Back, in the small pools of the rapids.

## HOMOPTERA.

*Agallia sanguinolenta*, *Prov*. June 26th.

*Parabolocratus viridis*, *Uhler*. This insect was erroneously given in the list as *Gypona quebecensis*, *Prov.*, which is a synonym of *G. striata*, *Burm*.

*Deltocephalus inimicus*, Say.

*Athysanus extrusus*, Van Duzee. June 17th.

*Athysanus curtisii*, Fitch.

*Phlepsius incisus*, Van Duzee. July 29th.

*Phlepsius humidus*, Van Duzee. July 31st. Aylmer.

*Ulopa canadensis*, Van Duzee. Common. This was referred to in previous list as *Ulopa n. sp.* It has since been described from specimens taken at Ottawa and Ridgeway, Ont. (Trans. Am. Ent. Soc. Vol. XIX, page 301). It is quite common in moss collected late in the fall and I have also taken it in the spring. No individuals have been observed with fully developed wings.

## REPORT ON ORNITHOLOGY, 1893.

### *To the Council of the Ottawa Field-Naturalists' Club :*

The Leaders in Ornithology beg to report as follows :—

The birds of this district have been under observation for so many years that any additions to the recorded list must almost of necessity be regarded as merely casual or accidental visitors. Of this character are the first two records which follow—

Brunnick's Murre, (*Uria lomvia*). A flock of 20 seen by Mr. G. R. White on the 20th of November on the Ottawa River near the city, out of which 5 were secured. They were identified by Mr. Robert Ridgeway of the U. S. National Museum. Reference has already been made to these in the "NATURALIST" for January 1894, p. 164.

Chewick, towhee, (*Pipilo erythrophthalmus*). One seen by Messrs. F. A. and A. P. Saunders 19th July, about 80 miles north of Ottawa near the Desert. This bird was certainly a long distance from its usual habitat, and the observers being without a gun at the time were unable to "collect" it; but both of them are familiar with the species in western Ontario, and they are positive of the identification in this instance not only by sight but by call-note.

Holboell's Grebe, (*Colymbus holboellii*). There are but three previous records of this species here. On 6th September Dr. E. S. Wiggins shot one out of a flock of 5 or 6 on Shirley's Bay, Ottawa River.

Cowbird, (*Molothrus ater*). The report for 1891 recorded an instance of a pair of chipping sparrows, whose nest had been invaded by a cowbird in the usual fashion, but who succeeded in bringing their own young to maturity as well as the young cowbird.

The same observer, Miss Gertrude Harmer, in her notes for 1893, tells of a like case which came under her notice this year, and in which the result was equally fortunate. We are not aware of any other records similar to these, but it is possible that closer observation, on the part of those who may be fortunate enough to find nests containing eggs of the cowbird, might serve in some degree to relieve this species of the blame that has always attached to it, as a preventer of the hatching of the eggs of other birds.

An albino specimen of this species was observed this autumn near Shirley's Bay by Dr. McElhinney and Messrs. Robson and Thicke.

A number of minor observations in bird life, such as do not call for a place in this report, have been noted from time to time during the year in the Ottawa "NATURALIST," under the head of Notes on Ornithology.

The table of first and last appearances of migrants for 1893 has been prepared, but owing to the comparatively small number of records it has not been deemed advisable to publish it. It may, however, be referred to when required.

All of which is respectfully submitted.

A. G. KINGSTON.	} <i>Leaders.</i>
Wm. A. D. LEES.	
E. BOLTON.	

NOTE.—The second excursion was held on Saturday, 23rd June, to Wakefield, and was a very successful and enjoyable trip, of which a fuller account will be given next month.—The several Sub-Editors could contribute very greatly to the value and interest of the NATURALIST, and also lighten the work of the Editor, by sending in contributions more regularly. (Ed.)

August, 1894.

THE  
OTTAWA NATURALIST.

VOLUME VIII. No. 5.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued August 4th, 1894.

Published Monthly at \$1.00 per annum.

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EXTRAS—BILLINGS, W. R. Palæontology. An elementary lecture,  
pp. 11, 5c.

ELLs, R. W. Asbestos ; its history, mode of occurrence and  
uses. pp. 24, 10c.

*(Continued from page 60.)*

Nitroglycerine was found so difficult to handle that five years afterwards Noble invented dynamite, which is simply a sand soaked with nitroglycerine. Other absorbents for it have also been used, and the giant powder so much used in western mines is a mixture of common gunpowder and nitroglycerine. The new blasting gelatine is simply nitroglycerine in which 7 or 8 per cent. of gun cotton has been dissolved. Lithofracteur, dualine, colonia powder, fulminating, sebastine, serranine, rackrock, atlas powder, vulcan powder, neptune powder, forcite, are all mixtures containing nitroglycerine. Hellhoffite, carbonite, roburite and kinetite have nitrobenzol for the explosive constituent. Mellinite consists essentially of picric acid. As for smokeless powders their name is legion and it would be useless to go into their composition. One of them, however, may be mentioned, namely cordite said to have been invented by Sir Frederick Abel and Professor Dewar. It is said to consist of nitroglycerine and gun cotton or some other nitrocellulose, and to have been adopted by the British Government for the army and navy.

(Experiments were here introduced ; the burning of gun cotton and of nitrocellulose.)

I have already indicated to you the percentage composition of the albumen of eggs, the casein of milk, and the fibrin of blood, and I might go on and characterise many other of the animal albumenoids which have been separated by chemists. This is, however, unnecessary for our present purpose and besides there have been detected in the examination of the animal fluids and tissues other albumenoids very difficult to classify under the headings which have so far been adopted by chemical physiologists. In fact ; products seem to have been discovered which indicate the existence of transitions or gradations betwixt those albumenoids which have already been accepted as pretty well defined compounds.

There exists, however, another set of albumenoids in the bodies of animals which it is impossible in a lecture on Nitrogen to pass over without notice. Beilstein calls them the Protein substances of the connective tissue. In English they are sometimes called the fibrous albumenoids and are a very curious class of substances. To it belong hair, wool, glue, etc., which in spite of their different characters are similar in composition.

Possibly these nitrogenous substances might be classed by themselves as colloids. They are possibly less hydrous than the proteids or albumenoids. This table exhibits their per centage composition.

	C.	H.	N.	S.	O.
Hair .....	49.7	6.4	17.1	5.0	21.8
Wool .....	50.6	7.0	17.7	?	
Feathers.....	51.9	7.2	17.8	?	
Skin (humansole).....	50.3	6.8	17.2	?	
Oxhorn .....	50.7	6.7	16.2	?	
Glue .....	50.0	6.5	17.5	?	
Gelatine.....	50.0	6.7	18.3	?	

#### Formulae of the Colloids.

Gelatine .....	102.0	151.	31.		39
Chondrine .....	99.0	156.	40.		42
Keratine .....	230.5	381.	70.	6.	77

We learn from the characters of the colloids that some nitrogenous substances are very stable. Such are the compounds which constitute the horns and hoofs of animals, the latter constituting the raw materials for the manufacture of those important products used in the arts and called cyanides, ferrocyanides, sulphocyanides, &c. The first step in their production is the fusion of the substances rich in nitrogen with carbonate of potassa in iron vessels. Subsequent lixivation and crystallisation yield what was long known as yellow Prussiate. The essential constituent of these salts is the compound radical Cyanogen  $C_2N_2$  as it is also of the well-known pigment called Prussian Blue. In fact the history of these compounds begins with the production of Prussian Blue about 180 years ago. Equal parts of cream of Tartar, saltpetre and ox-blood were heated together in order to produce the solution from which, by the use of green vitriol, the colour was precipitated.

EXPERIMENTS.—Production of Prussian Blue. Decomposition of mercuric sulphocyanide.

Another very interesting set of nitrogenous substances are those which are formed in dead and decomposing animal matter. These are sometimes of a basic nature, are formed in the human corpse after

death, and have been called by Selmi, their discoverer, Corpse-alkaloids or Ptomaines. Some of these compounds are very poisonous, and Brieger calls them Toxines. To such substances are to be attributed the cases of sickness and death we frequently hear of from eating unsound meat and meat preparations. All decaying animal and vegetable matter produces substances dangerous to health in various ways, and among the most dangerous and disagreeable of these products are those resulting from the decomposition of the albumenoids.

But why is it that organic substances when left to themselves are so prone to decomposition? We have seen that they can exist and pass through vegetable and animal organisms, nourishing and sustaining them, and exercising most beneficent influences in the economy of living organised bodies. Why is it that outside of these they behave in an altogether different and most dangerous fashion? What is it that regulates and controls their chemical affinities for good when they form part and portion of an active living organism? More than forty years ago Justus Von Liebig put forth a theory according to which the force which controls the affinities is the vital principle. This theory I have never seen any reason to abandon, and I shall try to state it in Liebig's own words.

"The production of organs, the co-operation of a system of organs, and their power not only to produce their component parts from the food presented to them, but to generate *themselves* in their original form and with all their properties, are characters belonging exclusively to organic life, and constitute a form of reproduction independent of chemical powers.

"The chemical forces are subject to the invisible cause by which this form is produced. Of the existence of this cause we are made aware only by the phenomena which it produces."

"The chemical forces are subordinate to this cause of life just as they are to electricity, heat, mechanical motion and friction."

"Such an influence, and no other, is exercised by the vital principle over the chemical forces."

"The vital principle opposes to the continual action of the atmosphere, moisture and temperature upon the organism, a resistance which is, up to a certain point, invincible. It is by the constant neutralisa-

tion and renewal of these external influences that life and motion are maintained."

(Agriculture and Physiology, pp. 389-90.)

When Liebig wrote thus he was perfectly well aware of the artificial production of urea by his fellow investigator, Woehler in 1828, and therefore could not have thought that that discovery was antagonistic to his theory of the influence of the vital principle. Gmelin, the author of the great hand-book of Chemistry, had in 1817 maintained that organic compounds cannot, like in-organic compounds, be artificially built up from their elements, and Berzelius also enforced this distinction, asserting that while in-organic bodies could, organic bodies could not be artificially produced. Woehler's discovery and others of a like nature since, have gone to prove that this was too sweeping an assumption. Many organic bodies have been produced artificially but by means and from substances altogether different from those employed in nature. Take the production of urea by Woehler. He obtained it by heating a solution of cyanale of ammonia. But that substance was produced, by decomposing the potash salt, and the latter from fusing yellow prussiale of potash and caustic potash with red lead. All of these substances are foreign to food and organic life and most of them are of a highly poisonous character. No wonder then that Liebig took no notice of such discoveries as invalidating in the slightest degree his contention that Life modifies and controls chemical affinities. He knew very well that chemists would never be able to produce an organic cell or a starch granule, and we know that, since his time every attempt to produce urea by the oxidation of the albumenoids has failed. And even although it should be found possible in the distant future, to fabricate, let us say, some grains of sugar in a roundabout way from strange artificial materials and with the help of complicated apparatus, would it be reasonable to consider that as equivalent to its production from the carbonic acid of the atmosphere in the tissues of the sugar cane? I trow not. Nevertheless we have chemical authorities of high reputation expressing themselves in the following way. "At the present day the belief in a special vital force has ceased to encumber scientific progress. We now know that the same laws of combination regulate the formation of chemical compounds both in animate and inanimate

nature. So soon as the constitution of any product of the organic world has been satisfactorily ascertained we look forward with confidence to its artificial preparation." Roscoe Schorlemmer, Vol. III, part 1, page 10. I confess to much impatience on reading such a statement. Talk of the arbitrary assumptions of ecclesiastical authority! There never was anything of that sort equal to this scientific popery. It is enough to justify the clergy of the present day in exclaiming "Quare fremuerunt gentes." "Why do the heathen so furiously rage together and why do the people imagine a vain thing?" And no wonder that some unbelievers in science feel justified in adding "He that dwelleth in heaven shall laugh them to scorn; the Lord shall have them in derision."

But apart altogether from the opinions of those among us who are of a religious turn of mind, I feel bound to maintain that such assertions as the one I have quoted from Roscoe Schorlemmer are not reasonable. To ignore the existence of life and the wonderful influence which it exerts on organic substances is not a scientific proceeding. And it appears to me to be still more unscientific to ignore the Author of life and of the unity and order of the universe. Is it reasonable, I ask, after having contemplated the myriads of miracles observable all around us, the wonderful intelligence and power displayed in nature, the astonishing phenomena and inexplicable results which are exhibited in every department of science, to stop short in our reasoning, shut up our mental vision and declare that we can know nothing of the Originator of all these marvels, because perhaps their complete explanation does not lie ready to our hands. To me the wonder is that men are forthcoming so trained or school bound as to be able to put fetters on their reasoning faculties just at this point. No doubt there are limits to the powers of the human intellect, but I do not see why we should stop short of these limits. They have been defined by Emmanuel Kant in his treatise on pure reason, but that did not prevent Liebig and others from thinking and writing of an unfathomable wisdom. "The philosopher who has attained to the highest summit of moral wisdom, is he who, if he use his mind aright, has the clearest perception of the limits of human knowledge, and yet the most earnest desire for the lifting of the veil that separates him from the unseen.

So writes Carpenter the physiologist and further : " All our science is but the investigation of the mode or plan in which the Creator acts ; the power which operates is infinite and therefore inscrutable to our limited comprehension." I am afraid that of late it has not been customary or very fashionable, in discoursing of the wonders of nature, to make much reference to the existence of a higher power than nature. In this I think we err grievously and I do not hesitate to range myself with those who believe it to be their duty, on such occasions as the present, to acknowledge with reverence the Creator and His wondrous works. I have no desire to depreciate the powers of the human intellect or disparage full and free investigation, but we should remember that to err is human in scientific as well as moral respects. As Schiller says : " Error leaves us never ; but a high desire conducts the striving soul ever on towards the truth." Yes ; " towards the truth," but possession of the whole truth can never be ours. Newton's ocean will always be spread out before us, and although here and there an adventurous ship may dredge in its depths and add slightly to the sum of our knowledge, still infinite space will remain for the labour of the investigators of countless human generations yet to come. Do not let us therefore become impatient or querulous or sceptical because we are not permitted to know everything. Let us acknowledge that we are woefully shortsighted at the best, and when in our reading or thinking or investigations we find ourselves face to face with wonderful and inscrutable phenomena let us stand silent in awe and reverence, or if we must attempt to explain the ways of the omniscient Author of the universe let us simply repeat what we are told in Scripture, that " He upholdeth all things by the word of His power."

## SECOND GENERAL EXCURSION.

On Saturday afternoon, June 23rd, the members and friends of the club made their second excursion of the season, leaving by the 1 p.m. train for Wakefield and La Pêche.

Owing to several important events transpiring in Ottawa during the afternoon (notably a lacrosse fight) and the fact that many arrived at the station by electric car just too late to get on board, the party of excursionists was smaller than usual--about 70 being present.

Many of these, however, were among the most enthusiastic and indefatigable members of our society. Mr. R. B. Whyte, Mr. A. G. Kingston, Mr. Latchford, Dr. Ami, Dr. Bell, Col. White, Mr. Lambart, Mr. Whiteaves, Mr. Frank T. Shutt, Mr. R. A. Johnston, Mr. Glashan and many others of the "old reliables" were there and did all in their power to make the outing a pleasant and profitable one for their friends.

The afternoon proved to be cool, and all enjoyed the picturesque run up the Gatineau Valley. It is worthy of remark that though the club has made so many excursions into this romantic district, there always appear to be new charms for the lover of Nature in this beautiful vale. On the arrival at Wakefield, the excursionists separated into parties, under the guidance of the several leaders. The writer was with those who went to the top of the mountain, from which there was a magnificent view of the valleys of the Gatineau and La Pêche. The climb was a steep one, but all felt amply repaid for the fatigue. After a rest on the summit and the collection of specimens of rocks and flowers and ferns—among the latter some lovely *Woodsia* were brought home—and not forgetting the insects (for there were several ardent entomologists with us), the descent was made to the valley of the Pêche, where, about 5 o'clock, all the parties assembled for refreshments, which by this time proved most acceptable.

Arriving at the station, addresses were given by the vice-president, Mr. Shutt, and by Mr. R. B. Whyte and Dr. Ami. These short talks by the leaders on the collections of the day—which were on this occasion by no means insignificant—and on the flora, fauna and geology of the district visited, are always of practical character and should prove not only an encouragement, but a great help to those who are endeavouring to learn somewhat of the manifold ways and phases of Nature.

Due notice of date and place of the August outing will be given, and it is hoped that all with whom it is possible will be present—thus assisting the council in the very best way to make the excursion a pleasant and successful one.—F. T. S.

#### OBITUARY.

The sudden death on Thursday, March 29th 1894, of Mr. Scott

Barlow, geographer and chief-draughtsman to the Geological Survey, makes another gap in the ranks of the associates of the first Director, inasmuch as the subject of this notice aided his father, the late Mr. Robert Barlow, in the compilation of the beautiful maps and sections in the Atlas to accompany the general report for 1863, and to illustrate the labor of Sir William Logan and his associates in the first twenty years of the life of the survey ; a monument to their memory which will not soon perish, and for which medals were awarded at the first Paris and London Exhibitions.

His death is a loss to the profession generally, and his familiar face will be missed by his many friends and especially by his colleagues, with whom he was on terms of the kindest intimacy, and who all bear willing testimony to his high sense of honour and his devotion to duty. He leaves with them pleasant memories of his unfailing humour, generous, considerate forbearance and friendly counsel and assistance.

Mr. Barlow joined the Survey in November 1856, and had thus been more than thirty-seven years employed as surveyor, explorer and draughtsman. During the first years of his service he made important researches in conjunction with the late Mr. James Richardson, along the south shore of the St. Lawrence, and owing to his skill and painstaking accuracy was engaged to work up the field-notes of Sir William Logan.

In 1870 he was employed in the Springhill coal-field in Nova Scotia. By digging and boring by hand along the outcrop of the coal-seams he ascertained their extension north and south so well, that the workings for the last fifteen years at that colliery have not passed beyond the ground proved by him. He was withdrawn from Nova Scotia in 1878, and after he succeeded his father as chief draughtsman, the duties of that office occupied most of his time, although he made surveys of certain mining districts in the valley of the Ottawa River.

He also made original surveys of the north and south shores of the Ottawa River for a radius of some twenty miles, with a view to preparing a complete geological map of Ottawa and its environs, to form the first of a series of geological maps of the larger cities and centres of Canada.

Mr. Barlow leaves a widow, daughter of John Crichton Esq.,

formerly manager of the Valleyfield paper mills, and a family of six children. He also leaves two brothers, John R. Barlow, Deputy City Surveyor, Montreal, and Mr. Alfred E. Barlow, M. A., F.G.S.A.

H. F. & H. M. A.

Ottawa, June, 1894.

## REPORT OF THE ENTOMOLOGICAL BRANCH 1893.

### *To the Council of the Ottawa Field Naturalists Club:*

The Leaders have much pleasure in reporting that the Branch is in a prosperous condition and that a satisfactory amount of work has been accomplished during the past season. Frequent excursions were held and as a consequence many species have been added to the local lists. The occurrence of some of the rarer species has already been recorded in the Ottawa NATURALIST under the head of Entomology. It is proposed for the future to continue this method of recording captures, instead of making an extended annual report.

The publication of the Fauna Ottawaensis has been continued by printing a complete list, with notes, of the Phytophagous Hymenoptera by Mr. Harrington. In addition to the above a complete list of the Butterflies of the locality with notes on their habits has been prepared by Mr. Fletcher and is ready for publication.

LEPIDOPTERA.—Good work has been done, particularly in breeding. Two additions have also been made during the past summer to the list of diurnals, viz: *Argynnis Triclaris* Hüb. a northern species, taken in Labrador, Hudson Bay and westward. Seven specimens of this rare insect were taken on June 13th and 14th in the Mer Bleue. *Thecla Augustus*, Kirby was also taken in the same place on the third day of the same month. Two specimens of *Exyra Rowlandiana* were bred from cocoons found in the pitchers of *Sarracenia purpurea*. These cocoons were at the extreme base of the leaves, beneath the mass of decomposing insect remains, and were white, closely-spun and elastic. The beautiful moth *Dryocampa rubicunda* is recorded as taken at Ottawa this year for the first time. In Western Ontario it is sometimes injurious to the maples grown as shade trees.

COLEOPTERA. — Several good additions have been made in this order. The more notable of which are the following: *Dicælus teter*; *Oodes fluvialis*, hibernating under moss at St. Louis Dam, with *Lachnocyrtus parallelus*; *Donacia pubescens* taken in small numbers on bulrushes along the Rideau river early in June; *Toxotus vittiger*, twelve males of this handsome longicorn were taken at Casselman on June 13th; *Hypomolyx pinicola*, one specimen, and *Ditylus cæruleus*, two specimens, with numerous examples of *Tritoma humeralis* were taken on the same occasion. An interesting addition to the list was made in *Aphodius prodromus*, a European species recorded from the Northeastern States and as far west as Montreal, but not observed here until last spring when it was taken in some numbers at Ottawa and Caselman.

NEUROPTERA. — Very little has been done so far by members of the club in collecting and studying the true Neuroptera; but in the Pseudoneuroptera Mr. T. J. MacLaughlin has continued his collecting again this year. Last summer was particularly favourable for the insects of this family; no less than eight species were taken which had not been taken here before. Several specimens of the rare *Diplax costifera* were captured late in the summer, the first by Master Stephen MacLaughlin at the rear portion of the Powell property to the north of Bank street; others were taken later in the same locality and at the Experimental Farm. Previously only one specimen had been taken, in 1886. This species resembles the female of *Diplax rubicundula*, the most apparent difference is that the anterior margins of the wings of *costifera* are conspicuously shaded with a yellowish brown tint.

HEMIPTERA. — Several additions have been made to the list published in June, 1892. These will be submitted for publication later, when some unidentified species have been determined. *Pacilocapsus lineatus* and *Lygus pratensis* were noticeable from their abundance and injuries in gardens. An important discovery has been made by Mr. Slingerland, of Ithaca, that the former of these hibernates in the egg state in the twigs of bushes. This knowledge indicates judicious pruning as a means of checking the increase of this pest.

HYMENOPTERA. — A list of the phytophagous species observed during the season was published last January. The only species noticed as unusually abundant were the Ash Saw-fly, *Monophadnus bardus*, Say;

the Cedar Saw-fly, *Monoctenus fulvus*, Norton, which was taken in some numbers on an ornamental cedars on the Experimental Farm at the end of May, and the Cornel Saw-fly, *Harpiphorus tarsatus*, Say, also at the Experimental Farm where it attacked chiefly *Cornus siberica*. It may be mentioned that of a brood of the Rose Saw-fly, *Cladius pectinicornis*, of which the larvæ were collected in the autumn of 1892, it was found that, when the flies emerged last spring, there were just as many males as females, although in collecting the males are very rarely taken. In other sections of the order the species have not been so fully worked up as to justify the immediate publication of lists. Of the family Proctotrypidæ, however, our knowledge has been enormously increased by the publication of Mr. Ashmead's magnificent monograph, in which seventy species collected in this locality are mentioned, of which no less than fifty were new to science. Mr. Ashmead is now engaged on a monograph of the Braconidæ, and a series of our species has been placed in his hands for study.

DIPTERA.—In this order two observations of special interest are worth recording. (1) The root-maggot of the cabbage, *Anthomyia brassicæ* was very abundant, but was found to be much infested by two true parasites, *Aleochara anthomyiæ*, Sprague, and an undescribed insect to be called *Eucoila anthomyiæ*, Fletcher, both of which were bred from puparia collected last autumn. (2) The now notorious Horn-fly, *Hæmatobia serrata*, B. D., which made its first appearance in Canada last year at Oshawa, has now spread over the whole of the central portion of the Dominion from Essex, in the west of Ontario, to New Brunswick.

COLLECTIONS.—In addition to the fine collection of insects in the museum of the Geological Survey, we are glad to record that the collection specially prepared for the World's Fair is now on exhibition in museum of the Experimental Farm. This consists of twenty cases of Lepidoptera, Hymenoptera and Coleoptera, and forms the nucleus of what will be a most important exhibit.

Among the active members of the Branch mention should be made of Mr. W. Simpson who has done some good work. He has collected chiefly at King's Mere, in the Chelsea Mountains, where he has taken many of our rarer insects. He has also brought to our notice three in-

teresting monstrosities discovered by him in examining his coleoptera, in each of which the right antenna is curiously malformed. The species are *Dytiscus Harrisii*, *Desmocerus palliatus* and *Adimonia caviollis*.

MOSS-SIFTING.—We would specially call the attention of our entomologists to the value of the method of collecting moss late in the autumn for examination during the winter. This consists simply of tearing the moss to shreds and shaking it through a sieve over a sheet of white paper, when large quantities of small species, otherwise seldom found, can be collected. As an instance of what may be done in this line, two small cotton bags were filled with moss early in November, which, when carefully examined, yielded over one hundred species of insects in different orders. This method also gives valuable information regarding the species which hybernate in the perfect state. The bags should be kept slightly frozen, but not exposed to excessive cold, as 20° below zero has been found to kill everything in a bag.

J. FLETCHER,  
W. H. HARRINGTON, } *Leaders.*  
T. J. MACLAUGHLIN, }

#### ENTOMOLOGICAL NOTES.

During July many of the grasshoppers and other members of the order Orthoptera become fully grown, and as their numbers increase they do marked damage to vegetation. In the adult state the majority of the species possess fully developed wings, and can thus move more rapidly to new feeding grounds. There are however, wingless forms and of these a very interesting species is now abundant, although perhaps many of our members may not observe it. This insect is commonly known as the "Walking Stick," a name which its appearance easily gains for it, while entomologists have named it *Diapheromera femorata*. When young the "Walking Sticks" are pale green and not easily discerned on the young foliage of the trees, hickory and oak, upon which they feed. They grow brownish with age, and attain a length of about three inches, the female being stouter and less active than the male. The legs and antennæ are very long and slender and the whole structure of the insect tends to disguise it and to prevent its enemies from detecting it as long as it remains upon its food plants. A charming article by Dr. Scudder on this group of insects, with beautiful illustrations, appeared in a recent number of Harper's Magazine.

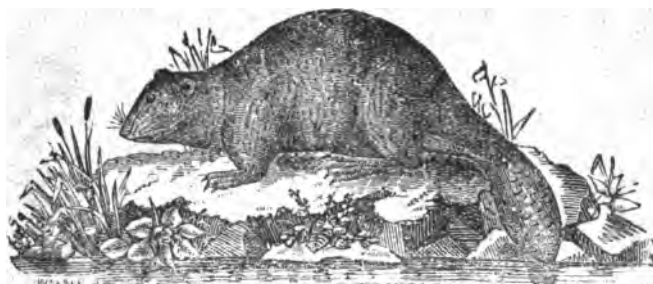
W. H. H.

EXCURSION TO GALETTA BY O. A. & P. S. RY., 8 A.M., 15th SEPT.

September, 1894.

THE  
\* OTTAWA NATURALIST \*

VOLUME VIII. No. 6.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued September 13th, 1894.

Published Monthly at \$1.00 per annum.

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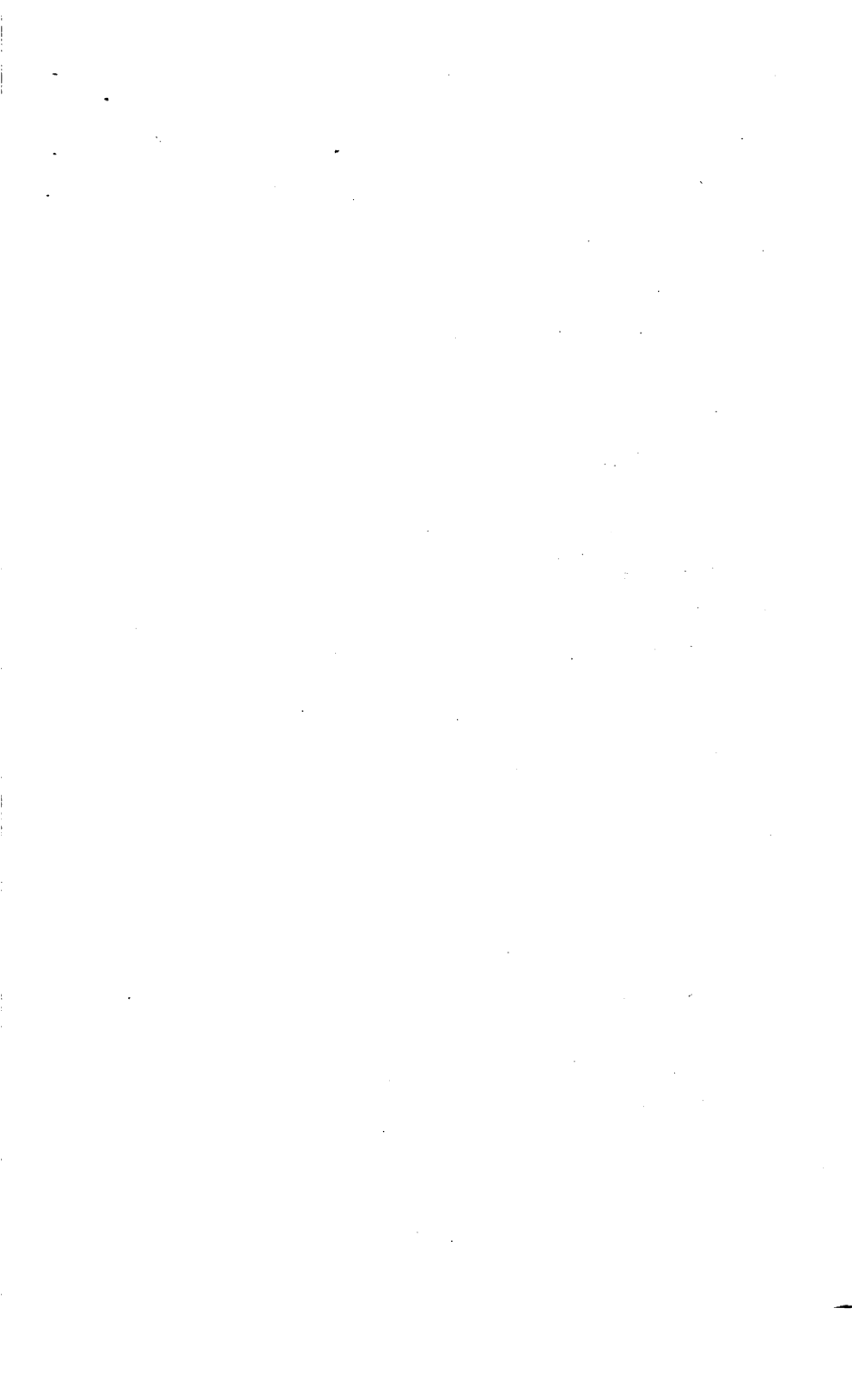
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CLIFF ON MOUNTAIN HILL, QUEBEC CITY,  
Shewing masses of fossiliferous limestone imbedded in contorted shales.

*(To illustrate Mr. Weston's and Dr. Ami's paper.)*

## NOTES ON THE "QUEBEC GROUP."

By T. C. WESTON, Esq., F.G.S.A., of the Geological Survey of Canada.

Out of the 12,000 feet or more of strata which form the much discussed "Quebec Group," there are several interesting escarpments and sections which have hitherto not received the attention they deserve. One of these escarpments is the Mountain Hill cliff, \* which forms a portion of the heights over which the ramparts of the City of Quebec are built.

The only reference I can find, at the present time, to this special locality, is Dr. Ami's paper on "the Geology of Quebec and environs," published in the "Bulletin of the Geological Society of America," Vol. II., pp. 477-502, 1891, from which I quote the following. "Alongside and up the Mountain street, a bold cliff of conglomerate occurs, containing large boulders, imbedded in a shaly and calcareo-argillaceous paste, with an admixture of quartz grains. This deposit, as well as most of the exposures in Quebec city, deserves very special attention, and will no doubt afford interesting notes and material."

A close examination of the cliff immediately facing Mountain Hill House, on the lower part of the hill, shows it to be composed of a coarse grey nodular limestone; in places, bedded structure may be seen, while the principal portion, (which is the matrix of the conglomerate), is compact, and sometimes flinty, with seams of carbonaceous or bituminous matter.

This portion of the cliff is prolific in fossils, but they are chiefly fragmentary, and might readily be overlooked. This is probably the reason why in the early study of the geologic structure of the city portion of the 'Quebec Group,' these were included in the Lévis Division of the same.

No fossil remains had been found or observed in the Mountain Hill cliff until the summer of 1877, at which time the writer discovered a number of interesting species. In 1892, another opportunity was afforded me to examine that portion of the exposure immediately back of the Express office and adjoining the book-binding establishment. On that occasion there were found some remarkably well-preserved fossils,

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\*See Plate accompanying this and next paper.

some of which were immediately recognized as being characteristic Trenton forms. Dr. Selwyn arriving in the city at that time, accompanied me to this locality, and several new species were added to our former collection.

In conjunction with this paper will be found a list of the genera and species of fossil remains determined by Dr. H. M. Ami, of the Survey. It will be readily seen from the lists prepared that a good proportion of them are common Trenton forms—a gratifying circumstance to the Director of the Geological Survey of Canada—Dr. Selwyn—who was the first to recognize the Quebec city rocks as a portion of the Trenton zone, and not *Levis*, as originally supposed.

However, as the formation under consideration contains large boulders of dolomitic limestone, which were evidently derived from the Levis limestone conglomerates, in which we may find Levis fossils in the shaly portion of the cliff, as in the shales and limestones at the back of the St. John street (Montcalm) market, we must not take the whole as typical Trenton, but as a mixture of Trenton, Utica, and Hudson River.

Quebec City, Que., May, 1894.

## NOTES ON FOSSILS FROM QUEBEC CITY, CANADA.

By HENRY M. AMI, M.A., F.G.S., &c.

The environs of Quebec city have long been regarded as classic ground to the student of North America Geology.

From the numerous rock-formations around the city, some of the most interesting and important specimens were obtained by various members of the Geological Survey staff, under the '*old régime*' and under the present administration.

The faunas entombed in the rocks of the so-called 'Quebec Group' at Point Levis and elsewhere, have been described by Billings, Hall, and other palæontologists. Strange to say, however, for some reason that cannot be accounted for, the sedimentary rocks forming the Citadel Hill and massif of Quebec city, remained for a very long time a *terra incognita*. It is only during recent years, that the veil has been

drawn away from these obscure and difficult portions of the region in question through the researches of Mr. T. C. Weston, F.G.S.A., of our Geological Survey. It was in 1877, that, for the first time, Mr. Weston discovered fossil remains in the strata of Quebec city, and amongst the specimens collected on that occasion there were noted the obscure remains of *Leptana sericea*, Sowerby, and of a species of *Ampyx*, closely related to *Ampyx rostratus*, together with crinoidal fragments. These came from the limestone rocks of Mountain Hill.

The purpose of this paper is mainly to note the interesting discovery of fossils made this summer by Mr. Weston, in the rocks of Mountain Hill, of which Mr. Weston gives a description in the foregoing pages of the NATURALIST. There is added to the notes on the fossil remains collected this season, a few more on the small but likewise important collection made by Mr. Weston and Dr. Selwyn in 1892. The determinations are of course preliminary and dependent upon the mode of preservation, etc.

#### MOUNTAIN HILL FOSSILS.

Inasmuch as the collections of 1892 and 1894 were both made by Mr. Weston—and at the very same locality, there is no practical reason for keeping them separate at this time, and for the sake of brevity they will all be grouped together under the heading of Mountain Hill fossils, Quebec City. The collections comprise in all about 125 specimens and embrace an assemblage of forms which are for the most part new to the massif of Quebec city, whilst not a few are probably new to Canada.

#### PRELIMINARY NOTES ON THE FOSSILS.

##### PROTOZOA.

1. *Nidulites favus*, Salter, var. A rather crushed and imperfectly preserved specimen of what appears to be a variety of Salter's species, *Nidulites favus*, a Rhizopod with marked affinities for such genera as *Pasceolus*, Billings; *Sphaerospongia*, Salter, and *Cyclocrinus*, Eichwald. The hexagonal character of the "plates," the presence of the 'central papilla' or styliform projection in the central portion of the plate are

features which the Quebec specimen shows distinctly. The main difference is of size. The plates in the Canadian example of *Nidulites*, are considerably smaller than those in the type of Salter's species from Europe\*: there being ten plates in the space of one centimetre in the former and six plates in the same space in the latter. This species has not heretofore been recorded in Canada, and forms an interesting addition to our fauna.

*Note.* The occurrence of this species along with many of its associates also points to the close relation which probably exists between the rock formations of the Girvan succession in Scotland, and those of the fossiliferous 'Quebec group' in Canada, a correlation which had already been made apparent to the writer on account of the similarity of the faunas.

#### CELENERATA.

2. *Streptelasma corniculum*, Hall. A small and rather obscure turbinate coral occurs in the collection. From its characters and affinities it appears to be closely related to the ordinary Trenton form described by Hall from the New York series. The Quebec specimen is here referred to in this species with some uncertainty.

3. *Diplograptus*, cf. *D. rugosus*, Lapw. Among the specimens collected on Mountain Hill only one graptolite occurs, and that appears to be a diplograptid, allied to Prof. Lapworth's *D. rugosus*. It is not well preserved, and the hydrothecæ are somewhat irregular and recall *D. amplexicaulis* of the Trenton.

#### BRYOZOA.

4. *Pachydictya acuta*? Hall. A number of broken and more or less imperfectly preserved stipes of this species occur on the weathered surfaces of the limestone. *Note.* Besides the above species of Polyzoa (Bryozoa)—doubtfully referred to *P. acuta*, Hall, there are several fragments of branching Bryozoa which require to be examined microscopically in thin sections before they can be determined with any degree of accuracy. From a mere superficial examination of the zoecial aper-

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\*See Nicholson and Etheridge, Jr., "A Monograph of the Silurian fossils of the Girvan District in Ayrshire, I., p. 18, 1874."

tures and characters of the polyzoary, the following genera appear to be represented:—*Monotrypella*, *Batostoma*, *Homotrypa*, etc., forms similar to those from the Trenton rocks of Canada and elsewhere.

#### BRACHIOPODA.

5. *Acrotheta* sp. A small but interesting specimen of this genus occurs in the collection, but its specific relations are not yet definitely ascertained.

6. *Acrotheta* sp. indt.

7. *Discina* or *Lingula*, sp. indt.

8. *Schizotreta* cf. *S. minutula*, Winchell and Schuchert. Two valves, one a brachial and the other a pedicle-valve of this interesting genus, occur associated with numerous other species of brachiopoda. They closely resemble the above species to which they are referred with some doubt whilst they also indicate close relation to *Discina Pelopea*, Billings, a true species of *Schizotreta*.

9. *Paterula*, sp. nov. An interesting form of this genus rare in America was collected in the limestones at Mountain Hill, Quebec. In general outline and leading characters it resembles closely *P. Bohemica*, Barrande, but is probably distinct. This species is certainly distinct from another species discovered by Mr. Weston in the rocks adjoining the Montcalm market, Quebec, and figured by Hall in his Vol. VIII. of Pal. N. Y. State, on Brachiopoda. This species of *Paterula* very closely resembles a form collected by Prof. L. W. Bailey in the black limestones of the Becaguimic Valley, in New Brunswick, in 1884, but is much smaller, being only one millimetre in length.

10. *Lingula Nympha*, Billings. A rather large individual of what appears to be a species identical with the above which was originally described from Newfoundland. The septum, central scars and other characters of generic importance are clearly visible, and the general outline of the shell make it very probable that this "Quebec Group" species occurs at Quebec also. With this species compare *L. Elderi*, Winchell and Schuchert.

11. *Lingula*, sp. Resembles one of the forms from the "market rocks" of Quebec—probably "species No. 1" of my appendix to Dr.

Ells's report for 1888, published in 1889. This species also resembles one from the limestones of the Beccaguimic, N.B., collected by Dr. Bailey.

12. *Lingulepis*, sp. With exceedingly fine radiating striæ. Shell: ovate, elliptical, anterior margin rounded; greatest breadth at about three-fourths distance from beak to anterior margin. Beak rather prominently pointed.

13. *Leptæna* (*Plectambonites*) *sericea*, Sowerby, sp. Two or three typical examples of this characteristic Trenton species occur in the collection from Mountain Hill. One form resembles the Hudson River or Lorraine variety, being large and quadrangular.

14. *Leptæna* (*Plectambonites*) sp. A diminutive form of *Leptæna* closely resembling *L. sericea*, but probably distinct also occurs in the collection.

15. *Strophomena Aurora*, Billings.

16. *Strophomena* (*Rafinesquina*) *alternata*, (Conrad, MS.)  
Emmons.

17. *Strophomena* (*Rafinesquina*), sp. nov.

18. *Strophomena* or *Leptæna* shell, similar to the form occurring at the Montcalm market exposures. Probably new generic type.

19. *Orthis* (*Dalmanella*) *testudinaria*, Dalman.

20. *Orthis* (*Plectorthis*) *plicatella*, Hall. Probably the above species. The specimen is not sufficiently well preserved to state definitely. May be *Orthis* (*Dinorthis*) *pectinella*, Conrad.

21. *Orthambonites*? sp.

22. *Camerella* or *Anastrophia*, sp.

#### GASTEROPODA.

23. *Metoptoma*, sp. There appear to be two forms of this genus in the collection from Mountain Hill, one a comparatively large form the other much smaller. The smaller ones shows concentric zones. Beak in both eccentric pointing anteriorly.

24. *Murchisonia*? sp.

#### CIRRIPEDIA.

25. *Turritepas*, sp. nov. Several specimens of a species of Tur-

rilepas occur in both the 1892 and 1894 collections. This species is identical with another found in a lot of Newfoundland fossils, labelled "Port-aux-Choix," and collected by Mr. Richardson. The species is very closely related to one of the forms described by Nicholson and Etheridge from the Girvan district (*loc. cit. ante.*)

#### ENTOMOSTRACA.

- 26. *Primitia* sp. No. 1.
- 27. " sp. No. 2.
- 28. *Isophilina* sp. indt.

#### TRILOBITA.

29. *Ampyx*, cf. *A. normalis*, Bill., or its near ally. *A. rostratus*, Sars. The latter species occurs in the rocks of the Girvan succession, and this is abundant in the rocks of Mountain Hill. It was collected in 1877, in 1892 and 1894.

30. *Amphion*? sp. indt. An imperfectly preserved or obscure pygidium of a trilobite, which is most probably referable to this genus.

- 31. *Bathyurus*, sp. No. 1.

- 32. " sp. No. 2.

- 33. *Dolichometopus*? sp. or *Symphysurus*, sp.

34. *Remopleurides*, sp. No. 1. Apparently new. Differs somewhat from *D. Schlothimi*, Billings, and from *D. Canadensis* and *D. affinis*, already described from Canadian rocks. It belongs to the typical or smooth form, of which the last two mentioned are types.

The Mountain Hill specimens, which are tolerably abundant, are not unlike in general outline to *Remopleurides Barrandii*, Nicholson and Etheridge Jr., good specimens of the cephalon of this species occur in both the 1892 and 1894 collections.

- 35. *Remopleurides*, sp. No. 2. Smaller form.

- 36. *Dalmanites callicephalus*? Green.

37. *Calymene senaria*, Conrad. (= *C. tuberculata*, of European authors, also *C. Blumenbachii*)

- 38. *Asaphus canalis*, Conrad.

39. *Asaphus*, sp. cf. *A. megistos*, Locke.
40. *Ceraurus pleurexanthemus*, Green.
41. *Phacops Brongniarti*, Portlock, or a very closely related species.
42. *Microdiscus* ?? sp. indt., or *gen. nov.* A very diminutive form of trilobite occurs with *Nidulites favus* ? Salter, and *Remopleurides* sp. No. 1. It is more closely related to the genus *Microdiscus*.
43. *Trinucleus concentricus*, Eaton. Very fine and numerous examples of this typical Trenton species occur in Mr. Weston's collection. These are precisely like those which occur at Montmorency Falls, above the Falls, near Quebec.
44. *Trinucleus*, sp. indt. A much smaller but prolific form of this genus occurs with many of the foregoing species. It differs from the other chiefly in size, in being strongly tuberculated and in other subordinate characters. Head and pygidium *four* millimetres and scarcely *four*, respectively.
45. *Illænus*, sp.

*Note.*

(a.) Besides the above there appear to be indications of the presence of such forms as *Agnostus*, *Staurocephalus*, *Dicranopora*, and numerous fragments of crinoidal and cystidean remains.

(b.) It may not be uninteresting here to note the discovery made by Mr. Weston this summer, in the rocks on Valier street, Quebec city viz. a portion of a large crinoidal column *eight* millimetres in diameter. A length of 7.5 mm. of the column is preserved.

This specimen strongly resembles similar crinoidal fragments sent to Mr. Whiteaves, of the Geological Survey, in 1882, and belonging to the "Wappinger limestone" of the vicinity of Poughkeepsie, N.Y.

(c.) It will thus be seen, that so far, from the interesting collections made by Mr. Weston in 1877, 1892 and 1894, respectively, we have no less than *forty-five* species of fossil remains. These will, no doubt, be supplemented by new and in such cases, probably better specimens, so that this preliminary report will probably be superseded before very long. A great deal of credit is due Mr. Weston for his perseverance in the work he has accomplished, and the present paper brought out in connection with the announcement of this discovery by

Mr. Weston, is prepared in the hope that it will help to throw some light upon a district which, although in the midst of a large and growing population, is still almost entirely unknown and unwritten.

(d.) The following is a recapitulation of the species included in the paper :

*Rhizopoda.*

1. Nidulites favus ? Salter.

*Cœlenterata.*

2. Streptelasma corniculum, Hall.
3. Diplograptus, cf. D. rugosus, Lapworth.

*Bryozoa.*

4. Pachydictya acuta ? Hall.

*Brachiopoda.*

5. Acrotheta, sp.
6. Acrotheta, sp. indt.
7. Discina or Lingula, sp.
8. Schizotreta cf. S. minutula, W. and S.
9. Paterula, sp. nov. cf. P. Bohemica, B.
10. Lingula Nympha, Billings.
11. Lingula, sp.
12. Lingulepis, sp.
13. Leptæna (Plectambonites) sericea, Sow.
14. Leptæna, sp.
15. Strophomena Aurora, Bill.
16. Strophomena (Rafinesquina) alternata, Emmons.
17. " " sp. nov.
18. Strophomena or Leptæna ?
19. Orthis (Dalmanella) testudinaria, Dalm.
20. " (Plectorthis) plicatella ? Hall.
21. Orthambonites ? sp.
22. Camerella or Anastrophia, sp.

*Gasteropoda.*

23. Metoptoma, sp.
24. Murchisonia ? sp.

*Cirripedia.*

25. Turrilepas, N. sp.

*Entomostraca.*

26. Primitia, sp. No. 1.
27. " sp. No. 2.

28. *Isochilina*, sp. indt.

*Trilobita.*

- 29. *Ampyx*, cf. *A. normalis*, Bill., and *A. rostratus*, Sars.
- 30. *Amphion*? sp. indt.
- 31. *Bathyurus*, sp. No. 1.
- 32. " sp. No. 2.
- 33. *Dolichometopus*? sp., or *Symphysurus*, sp.
- 34. *Remopleurides*, sp. No. 1. (n. sp.)
- 35. " sp. No. 2. (n. sp.)
- 36. *Dalmanites callicephalus*? Green.
- 37. *Calymene tuberculata*, (= *C. senaria*), Conrad.
- 38. *Asaphus canalis*, Conrad.
- 39. " sp. cf. *A. megistos*, Locke.
- 40. *Ceraurus pleurexanthemus*, Green.
- 41. *Phacops Brongniarti*, Portlock.
- 42. *Microdiscus*? sp. indt.
- 43. *Trinucleus concentricus*, Eaton.
- 44. *Trinucleus* sp. indt probably n. sp.
- 45. *Illænus*, sp.

Ottawa, August, 1894.

## SUGAR AND ITS MANUFACTURE.

By Adolf Lehmann, B.S.A., late Asst. Chemist, Dominion Experimental Farms.

The manufacture of sugar is an art which, like many others, has come to us from the far East. Its beginning is somewhat obscure, but probably it was first carried on, in a primitive and very limited way, by some of the tribes or nations of India. It has since, with the successive strides of civilization, assumed greater and grander dimensions. The Persians, Arabians and Spaniards, have in their turn been improving and extending cane-sugar manufacture. Other nations, notably the English, and in former days the Italians, especially the Venetians, have materially assisted in this work.

In Persia, the industry was relatively at its height during the eleventh century. At this time the product was especially prized as a medicine; in fact it was manufactured for this purpose until the extended use of tea and coffee made its use more universal. Shortly after the discovery of America, the industry was planted in the West Indies. Soon these islands began to supply the principal portion of

this commodity, a position they retained for centuries. But during the past thirty or forty years, cane sugar has found a strong competitor in beet sugar. Now, Germany stands at the head of the sugar producing nations, and the beet furnishes the principal portion of the sugar on the market. This position has not been attained through the superiority of the beet as a sugar producing plant—for it is more difficult to manufacture sugar from it than from the cane—but through the energy, perseverance, and almost endless work of men of science.

In 1747, Marggraf, a German chemist, the director of the Academy of Science at Berlin, discovered sugar in different members of the beet family. His pupil and successor, Karl Achard, built in 1799 the first beet sugar factory near Berlin. He spent a fortune and a large portion of his time in developing the industry, and he may be said to be the father of it. Shortly before Achard's death, Napoleon I. placed such restrictions on the importation of sugar into the continent of Europe that at one time it reached the price of about 75 cents a pound. In addition to this import tax he compelled farmers to plant a definite area with sugar beets, and in other ways assisted the beet sugar industry. It flourished for a time, but appeared to be almost dead, especially in Germany, after these favourable legislations were removed. However, improved methods of manufacture and a careful attention to the cultivation of the beet, together with reduced prices in other farm crops, have made it an industry which, instead of receiving a bounty, pays a handsome revenue to the state in the form of an excise duty.

It is largely to the promoters of the beet sugar industry that we are indebted for the great reduction in the price of sugar. They have placed it within the reach of all, and transformed the luxury of yesterday into the necessity of life of to-day. They have also revolutionized the cane sugar industry—an industry which, although perhaps a hundred times as old as its young rival, still looks to it for instruction.

The plant from which sugar was almost exclusively made till the introduction of the sugar beet is the sugar cane, *Saccharum officinarum*. It is a plant which in appearance is not unlike Indian corn. The stalk is from one to two inches in diameter at its base, and generally from five to eight feet in height, although occasionally, especially in the more southern countries, it reaches fully double that length. The colour varies

from a greenish yellow and a yellowish green to a deep purple, depending upon the variety. Some varieties are striped, others are uniform in colour. The leaves are somewhat narrower, but otherwise resemble those of Indian corn. In Louisiana, the seed never ripens, in fact the flowers are never seen. In more southern latitudes where its growth is not interfered with by frost, it matures in about 18 months. It is a perennial. Its seeds are small and its flowers form an open panicle.

On the North American continent, Louisiana has ever held the position of the sugar manufacturing centre. The centennial of the first manufacture of sugar was celebrated at the sugar experimental station of Louisiana on June 30th, 1894. The southern half of the State is almost exclusively devoted to this industry, and but little cane is grown north of this. The sugar cane is propagated by a modified form of cuttings. The stalks, or sometimes portions of them, are laid in a horizontal position, generally two along side of each other, in furrows from four to eight inches deep and covered with finely pulverized earth. These stalks serve the same purpose as the planted potato. The buds develop into the new plants and the stalks serve to supply nutrition to them till they are able to draw food from the soil. The rows of cane are generally about five or six feet apart, formerly they were from three to five feet. In the rows the plants appear about every six to twelve inches ; but, as the season advances, these multiply by stooling, tillering, or suckering, in direct proportion to the fertility of the soil. With favourable conditions an acre will produce upwards of 30 tons of cane, and each ton gives 175 to 200 lbs. of sugar.

In Louisiana, where frost that injures the cane, frequently occurs in the latter part of December, harvesting is generally begun about the middle of October, and continued for two or three months. The cane is cut by hand with very wide thin-bladed knives about 18 inches long. The leaves and top of the cane are removed at the same time and the stalks conveyed by carts, or on the larger plantations, by cars to the sheds of the factory. Here it must not be allowed to accumulate too much ; for, like sorghum (and other plants from which sugar is occasionally made), cane deteriorates soon after it is cut. At present, the majority of planters have their own sugar houses. These are, however, gradually being replaced by central factories, and in the course

of time the manufacturing of sugar and the growing of cane may become separated, like the producing of milk and the making of cheese have become in Ontario.

As in other plants, the sugar of the cane is found dissolved in the juice. In Louisiana, this juice contains about 9%-14% of sugar, sucrose, 1% to 2 % glucose, and about an equal quantity of other solids. Two methods are at present used, on a large scale, to extract the juice. The one most generally employed for cane is that of pressing it out by passing the stalks as they come from the field between large iron rollers which almost touch each other. These rollers are frequently almost three feet in diameter, and six to seven feet long, and five, six, or even nine of them are placed in successive sets of three near each other. In the case of a five roller mill, the front set has three rollers and the one behind the remaining two. The stalks of cane in passing through these successive sets of rollers are, of course, pressed twice in each set of three; for two rollers are lying side by side at the bottom and the third is placed above and between these, in such a position that it almost touches the second one of the lower rollers but allows a little more space to be between it and the first of the lower rollers. This enables the cane to pass easily into the mill and to be at the same time thoroughly pressed. In order to make the extraction of the sugar from the cane as complete as possible, the cane is generally moistened with water while passing from one set of rollers to the next. When the stalks leave the mill they are practically dry and torn into comparatively small pieces, and present a somewhat spongy appearance. They are now largely used as fuel under the boilers of the sugar houses. The other method for extracting the sugar from the cane is called the diffusion process. It is the method almost exclusively employed in obtaining the sugar from beets. In it the cane is first cut transversely into pieces not more than an inch long, subsequently sliced, or shredded longitudinally as fine as possible, and packed tightly into a battery of iron cylinders or cells all connected with each other by pipes. Water is pressed into the first cell and from it to each succeeding one, remaining about ten minutes in each. Fresh water is passed through in this way several times, or until the chips in the first cell are practically free from sugar. These chips are then thrown out. After the cell has been refilled with fresh chips of sugar

cane it becomes the last instead of the first of the chain. All the cells are successively treated in like manner. Thus as little water as possible is used to dissolve out the sugar—a very important factor, since all the water will have to be evaporated off. This so-called diffusion juice contains approximately two thirds the percentage of sugar found in the mill juice of the same cane ; or in other words, two thirds of the “diffusion juice” may be considered as pure juice and the remaining third as water added to it.

The juice, no matter how obtained, contains in addition to water and sugar, a considerable portion of other compounds. Among these are albuminoids, amides, colouring matter, organic acids, gums and mucilages. All these have to be removed as much as possible before the evaporation of the water is begun. Frequently sulphur dioxide, produced by burning sulphur, is first used as a bleaching agent ; but unless it is decided to produce the highest grades of sugar directly at the sugar house, the advisability of its use may be somewhat questionable, since it has a tendency to reduce the sugar yield. Lime is invariably used as a clarifying agent, either alone or directly after the use of sulphur dioxide. It is generally added, suspended in water, to the juice, in large iron tanks—generally enough to make the juice slightly alkaline. The mass is slightly boiled and the skum removed from the top several times, or rather just as the scum forms. The precipitate is allowed to settle and the clear liquid drawn off. A further clarification and the removal of any excess of lime by the use of phosphoric acid will probably be adopted in the near future. The skimmings and settlings are pressed through heavy canvas filters, and the liquid separated from them, which of course contains a considerable percentage of sugar, is added to the other portion of clarified juice, which is now ready to be boiled into sugar. The solid portion is thrown away or used as a fertilizer.

The evaporation of the juice is generally carried on in two stages. The first, to near the point of saturation ; and the second to such a consistency that it will still run readily out of the vessel in which it has been boiled. Both these concentrations are almost invariably conducted in a partial vacuum. The vacuum is increased with the concentration of the juice. The initial evaporation is generally done in two or three separate vessels, the steam of the first being used to heat the

second and that of the second to heat the third. The final concentration is accomplished in a large iron vessel containing seldom less than five to six tons of sugar, or rather of a mixture of molasses and sugar, when the boiling is completed.

The molasses is separated by centrifugal force from the crystals of sugar suspended in it. In making the finer grades of sugar, the molasses still clinging to the sugar crystals is washed off either with steam or by the use of water. If a weak solution of stannous chloride is used in place of the water a sugar having a rich amber colour (Demarara sugar) is obtained. By great care in the manufacture and a liberal use of water in the centrifugal it is possible to make a sugar directly from the juice.

This sugar would be difficult, if not impossible, to distinguish from a product refined with animal charcoal. To get rid of the water still clinging to the crystals, the sugar is dried in a slightly inclined, horizontal, heated, rotating cylinder called a granulator. The sugar is called granulated and contains over 99% of sucrose. However, comparatively little sugar is made of this grade in the sugar houses, there being considerable loss by washing in the centrifugal. The greater portion is sold to the refiners. Here it is redissolved, filtered through animal charcoal and again boiled into sugar.

To produce a good quality of sugar, it is necessary to have the crystals of uniform size and as large as they can conveniently be made. Small crystals are liable to choke the sieve of the centrifugal, and prevent the easy and perfect separation of the molasses from the sugar, and this of course reduces the quality. The preliminary evaporation to near the point of saturation, gives the sugar maker a more perfect control of the crystallization. The process is briefly as follows: The pan in which the boiling is done is partially filled with the already concentrated juice, called syrup. This is boiled down till the crystallization has just begun. A small quantity of additional syrup is then drawn in. Thus by very slightly diluting the boiling mass the tendency to prevent any further crystals from forming is brought about. The amount of syrup added from time to time must be enough to do this but not so much as to redissolve the crystals already formed. The evaporation going on all the time, and no new crystals being allowed to form, those already there must increase in size, and that uniformly. The smaller the number of crystals relative to the size of the pan, the larger they can be made to grow.

The sugar obtained from the sugar beet, the sugar cane, the maple and the sorghum, differs only in the kind and quantity of impurities it contains. The pure sugar from all of these sources is identical. It is commonly called cane sugar, *sucrose*, the name being derived from the plant from which it was in the past principally made. In addition to sucrose, several other, however, less important kinds of sugar are on the market. The two principal of these are *dextrose* and *levulose*, sugars resembling each other in many respects. The former is now extensively made from Indian corn by transforming the starch in it with dilute sulphuric acid and neutralizing the excess of acid with lime. It is largely used in compounding the various mixtures sold as syrup on the market—few of which are now pure concentrated cane juice. Honey is a mixture of both these sugars, dextrose generally predominating. All sweet fruits contain one or other or both of them. Cane sugar when treated with a dilute acid yields an equal quantity of both of them in invert sugar. Even continuous heating at the boiling point of water has a tendency to transform ordinary sugar into invert sugar. Both dextrose and levulose crystallize with great difficulty. If present in a solution of sucrose they probably exercise a retarding influence on the crystallization of that sugar. Any agent, therefore, having a tendency to invert any of the sugar in the juice or syrup is doubly objectionable. Sulphur dioxide in solution has this tendency, especially when hot. Long boiling at high temperatures has also the same tendency. Both should be avoided as much as possible on this account.

In addition to the three sugars already named, at least seven others occur in nature, among these are milk sugar and malt sugar, *lactose* and *maltose*. But several times the number are known to chemists, some of them are fermentation or decomposition products, others have been made by the synthetical method. However, so far as I know, no cane sugar has ever been made by either of these ways. The stories sometimes heard that cane sugar is now made for commercial purposes from rags and sawdust are a myth. Perhaps they have arisen from the fact that dextrose is made from starch and possibly, at times, from such substances as I have just named.

Sugars belong to the carbohydrates, a class of compounds ably treated by Mr. F. T. Shutt, M.A., in a lecture on the Chemistry of

Foods, delivered before the Field Naturalists' Club during the winter of 1892. The sugars are the most soluble and the simplest members of this group. Their study from a chemical standpoint is exceedingly interesting, especially in relation to plant life, since it is highly probable that the other carbohydrates are formed from them.

## REPORT OF THE CONCHOLOGICAL BRANCH, 1893.

Presented at the Annual Meeting, March 20, 1894.

*To the Council of the Ottawa Field Naturalists' Club.*

The leaders of this branch beg to report that while they have not during the year given as much attention to the study of the shells of this vicinity, as they, in duty, were probably bound to do, they have nevertheless something of interest to report as the result of their observations. Two new shells were added to the Ottawa list during the year, both discoveries having been made by the Rev. G. W. Taylor. *Pupa curvidens* was noticed among a number of small shells taken at Hull. In ponds near St. Louis Dam, the small English *Planorbis nautilus* var. *cristatus* was taken for the second time on this continent. It had previously been found in America only at Hamilton, where it was collected three years ago by Mr. A. W. Hanham. The occurrence of this shell at Ottawa, nearly 4,000 miles from its home, indicates how readily, in modern days, shells may become widely distributed. Its presence in the ponds at St. Louis Dam is in great probability due to the large quantity of refuse packing material, such as straw envelopes, marsh grass, etc., which have for years been thrown into these ponds. It may be that the shells themselves could not withstand the changes to which the straw and grass would be exposed from the time it was gathered in England until it was thrown into the ponds, but from the extraordinary vitality which the eggs of molluscs are well known to possess, these might continue unimpaired even under the trying circumstances that must have obtained in this case.

An important find of the exceedingly minute and rather rare *Vertigo milium* was made in Billings's bush, one wet afternoon in August on the bark of a fallen oak. Here, in ten minutes, many more specimens of this shell were found than the collector had previously

seen in ten years. The large *Planorbis*, usually called *trivolvis*, but which, in the opinion of the leaders, is quite a distinct species, was found in abundance in the Rideau River west of Billings Bridge. The shells are easily obtained in the month of May, when like all other *Planorbis*, they are very active. Observations on this shell from the egg through various stages of growth to the adult shell may be stated at some future time and a description ventured.

The trip to Meech's and Harrington Lakes, of which an account is given in number 7, vol. vii, of *THE OTTAWA NATURALIST*, although undertaken under adverse circumstances, was attended with very happy results. An excursion to Lake Bernard, in still more inclement weather, met with little success, as but few shells could be collected. The Gatineau River, owing to its rapidity and the few bays which it contains, is noted for the absence of molluscan life. At Farrelton, however, in September, when the water was very low, a surprisingly large number of shells were obtained. Our three Margaritanas were found in abundance, and several others of the Unionidæ. The Ottawa River was too high throughout the summer to admit of successful collecting. The famous shoals at Duck Island, on one occasion; however, yielded a number of shells which amply compensated for the long row up and down the river.

A remunerative method of collecting small shells was found to be the gathering of moss during the autumn from woods and swamps. This moss is then sifted during the winter. In this way no less than 14 species were collected in one bag of moss taken from the edge of the swamp to the south of the St. Louis Dam.

The leaders will be pleased at all times to assist members either with instructions as to the best methods and localities for collecting, or in the naming of species.

F. R. LATCHFORD, }  
J. FLETCHER, } *Leaders.*

#### EXCURSION No.

Will be held on Saturday, September 15th, to Galetta on the O. and P. S. Railway.

The Train leaves at 8 A.M. Tickets, 60 cts. and 50 cts.; Children half-price.

October, 1894.

THE  
OTTAWA NATURALIST

VOLUME VIII. No. 7.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:  
PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued October 5th, 1894.

Published Monthly at \$1.00 per annum.

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pp. 11, 5c.

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uses. pp. 24. 10c.

## ANNUAL REPORT OF THE COUNCIL, 1893-1894.

*To the Members of the Ottawa Field-Naturalists' Club :*

In presenting this, the fifteenth Annual Report of the work of the Club, your Council has to announce that the year just closed has been one in which the Club's success, usefulness and activity have amply repaid the amount of time and labour devoted to it.

The very large attendance at the Excursions held during the summer season to Wakefield, Rockland and to Borthwick's shows plainly to what degree of popularity our spring and summer outings have attained.

Nineteen new members were elected by your Council and their names added to the membership roll. A few have resigned for various reasons.

Ten meetings of the Council were held during the past year at different times for the transaction of routine business, appointing leaders, preparing for excursions and soirees, and the publication of the OTTAWA NATURALIST.

Six soirees or evening sessions of the Club were held during the winter months as follows :

Dec. 12th.—Inaugural Address: The extinct Northern Sea-cow and early Russian Explorations in the North Pacific.

Dr. G. M. Dawson, C.M.G., F.R.S.

Jan. 9th.—Following a Planet. (*With lantern illustrations.*)

A. McGill, B.A., B.Sc.

Jan. 23rd.—Biological Water Analysis. (*With lantern illustrations.*)

Dr. Wyatt Johnston, Montreal.

Feb. 6th.—Disintegration and Denudation of Rocks.

Frank Adams, Ph.D., (McGill College, Montreal.)

Feb. 20th.—The Transmutations of Nitrogen. (*With chemical experiments.*) . . . . . Thos. Macfarlane, F.R.S.C.

Mch. 6th.—Ottawa Butterflies . . . . . James Fletcher, F.L.S., F.R.S.C.

Notes on the Natural History of the Islands of Behring

Sea . . . . . James M. Macoun.

The OTTAWA NATURALIST has been promptly published by our able and zealous editor, Mr. W. H. Harrington, on whom the *onus* of the editorial work has practically entirely fallen.

One of the first duties of your Council after election was to appoint Mr. Harrington as editor, and with this appointment the position of sub-editor was assigned to each of the following gentlemen engaged in various branches of work in connection with the Club, viz:—

1. Geology.....Dr. H. M. Ami.
2. Mineralogy.....Mr. W. F. Ferrier.
3. Botany.....Mr. William Scott.
4. Entomology.....Mr. James Fletcher.
5. Conchology.....Mr. F. R. Latchford.
6. Ornithology.....Mr. A. G. Kingston.
7. Zoology.....Mr. F. T. Shutt.

As may be observed in reading the NATURALIST for the past year, various notes bearing on these different departments of the Club's work above mentioned have appeared from time to time. It is earnestly desired, and this Council recommends, that this branch of the Club's work be carried on efficiently in the future, inasmuch as this method not only furnishes the editor with material for the monthly periodical, but gives also to the members current and interesting notes in these different topics.

Early last year a number of members of the Council and Club received blank forms prepared by a Committee of the Royal Society of Canada on which to record phenological observations. These have been filled and handed back to the Committee of the Royal Society whence they came.

The Council and the Club generally, have been under great obligation to one of their number (during the past year) in the person of Miss A. M. Living for the gratuitous designing and drawing of the beautiful cards of announcement of the different lectures and soirees given under the auspices of our Club.

Your Council has just recently had prepared a memorandum to be presented by the Hon. E. H. Bronson before the Ontario Legislature, stating the claims of the Ottawa Field-Naturalists' Club for aid and subsidy towards publishing the OTTAWA NATURALIST and for general educational work carried on.

The Treasurer's statement shows that after defraying all current expenses, including printing and publishing of the OTTAWA NATURALIST, our official organ, there is still on hand a balance of \$25.92.

A number of members are now in arrears. It is earnestly hoped that all will promptly settle with the incoming Treasurer and thus enable the Club to go on increasing in usefulness as in the past.

Sub-excursions were perhaps not held as frequently nor at as regular intervals last year as in former years. This part of the Club's work was a very prominent feature at one time. Our Saturday afternoon walking parties were very popular, and would, no doubt, be more so if the leaders would make it convenient to be present at the General Post Office at 2 o'clock as formerly.

The thanks of the Council and of the Club are due to Messrs. W. C. Edwards, M P., and Archibald Stewart, also to Mr. William Borthwick, for the hospitable manner in which they received the Club at the Rockland Quarries and at Borthwick's Springs.

We regret that, owing to the departure from Ottawa of Mr. William Scott, late Mathematical and Science Master at the Normal School, we have lost an active and zealous member of our Club. In his position as Librarian, Mr. Scott did good and efficient work for the Club. Since his departure your Council have unanimously chosen and requested Mr. R. H. Cowley, B.A., to act in the capacity of Librarian for the balance of the term up to this annual meeting.

To Dr. MacCabe, Principal of the Normal School, the Council of the Ottawa Field-Naturalists' Club feel greatly indebted for his kindness and generosity in granting us the use of the room in which we assemble now for the evening soirees during the winter months.

To Mr. McGill, to Dr. Wyatt Johnston, to Dr. F. D. Adams and to all who have assisted in making the past season a successful one, the Council desires to record its obligations.

In conclusion your Council beg leave to thank the members for the zeal and interest manifested at the Excursions during the past year and also at the winter soirees, and trust that the incoming year will mark another era of progress for the O.F.N.C.

HENRY M. AMI,  
*Secretary.*

Ottawa, March 20th, 1894.

## REPORT OF THE GEOLOGICAL BRANCH, 1893-94.

*To the Council of the Ottawa Field Naturalists' Club:*

In presenting the report of this branch of the Club's work for the past year, your leaders have to announce that considerable progress was made in examining the geological features of the districts about Ottawa and especially in the vicinity of the localities visited by the Club. Reports upon the facts observed on the excursions have appeared from time to time in the OTTAWA NATURALIST.

On two occasions, at the general excursions to Wakefield in May and to Rockland in July, your leaders performed the duties incumbent upon them. At the latter place one of the leaders collected a large amount of material in the way of rock-specimens and fossils from which he prepared a paper entitled: "Notes on the Geology and Palæontology of the Rockland Quarries and vicinity, in the county of Russell, Ontario, Canada." This paper has since been published\* and contains interesting reports on the chemical composition, the microscopic characters and petrographical and other physical relations of the limestone rocks in question. To Dr. B. J. Harrington, to Prof. H. P. Bovey and to Dr. A. P. Coleman, the writer is indebted for reports on these points.

As sub editor in the department of Geology, Dr. Ami has also prepared a number of interesting book notices and reviews of articles of general as well as local value. It is to be hoped that in the coming numbers of the OTTAWA NATURALIST there will be found notes on mineralogy, stratigraphy, palæontology and kindred departments of geological research in regular and systematic sequence.

There is a decided need of some publication here in Canada taking hold of this important branch of work, so that we heartily recommend the re-appointment of sub-editors in the various branches of the Club's work by the incoming council for 1894-95.

Early in the year two of the members of our Club, hearing that Mr. John Stewart was leaving the city, secured the balance of the geological collections he had made about Ottawa and elsewhere during

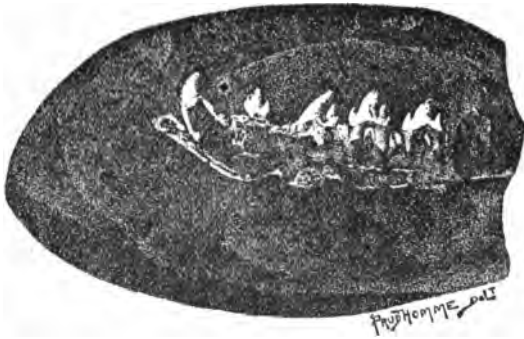
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\*OTTAWA NATURALIST, Vol. vii., 1893, No. 9, pp. 138-147.

the past ten years. These have all now been well nigh studied and determined. The bulk of the fossil collection, consisting of crinoids and cystideans, on which Mr. Stewart had spent a great deal of time, were purchased by Mr. J. H. R. Molson for the Peter Redpath Museum of McGill College, Montreal, and is now on exhibition in the cases of that institution.

A small collection was sent to Prof. F. A. Bather and Dr. Henry Woodward, of the British Museum, who expressed themselves as highly delighted with the specimens sent.

Dr. Ami is preparing a list of the species of fossils in the Stewart collection. Besides those from Ottawa and its environs there are not a few from Belleville, Hastings, Madoc, Havelock, and from other localities in central Ontario. .



The discovery of a *gouge* by Mr. J. Ballantyne or stone implement belonging to the aborigines of this portion of Canada in Mr. Graham's brickyard at Archville (Ottawa East), led to an interesting examination of the circumstances attending the finding of it. Amongst the fossil remains collected in the beds of clay and sand, were the following :

1. *Leda* (*Portlandia*) *arctica*, Gray, abundant.
2. *Macoma fragilis*, Fabricius.
3. " *calcareo* ? Chemnitz.
4. *Natica affinis*, Gmelin.
5. *Cylichna alba*, (Brown.)
6. *Balanus crenatus*, Bruguière.

Of these, No 5 is an addition to our list of Pleistocene shells from the Ottawa district.

Amongst the interesting specimens of Pleistocene fossils which came under our notice of late, was a portion of the lower jaw of a young seal found in a nodule of calcareous matter at Green's Creek.— This specimen was in the possession of Sir James Grant—one of our members. Sir James handed it to Dr. Ami, who had it photographed and reproduced (see accompanying cut), so that our members may have an opportunity of seeing it, and also for the purpose of placing it on record.

During his researches in the Ottawa and Gatineau districts, Dr. R. W. Ells noted the occurrence of marine shells at two localities, viz:—

(1.) MacGregor's Lake, two miles north of Perkins's Mills, at an elevation of 450 feet above sea-level. *Saxicava rugosa*, L., (= *Saxicava pholadis*) was found in great abundance with a remarkably firm and thick test.

(2) Near Cantley, P. Q., three species of Pleistocene and marine shells:—

1. *Macoma fragilis*, Fab.
2. *Saxicava rugosa*, L.
3. *Leda* (*Portlandia*) *arctica*, Gray.

HENRY M. AMI. }  
R. W. ELLS. } *Leaders.*  
W. F. FERRIER, }

March 19th, 1894.

## RECENT DEPOSITS IN THE VALLEY OF THE OTTAWA RIVER.

By R. W. ELLS, LL. D., F. G. S. A., F. R. S. C.

The question of the evolution and subsidence of the earth's crust is one which in recent years is engaging much of the attention of leading geologists both in Canada and the United States. Various opinions have been expressed on the subject, some contending that the submergence of the land can be measured by a very considerable amount ranging from 1,000 to 2,000 feet or even more, while others maintain that the change of level is very much less. Controversy on this point at times waxed warm; for involved in the general question is that

of the distribution of the drift deposits of sand and gravel and the great areas of clay, either of marine or fresh water origin. In the former of these, the earliest traces of man's existence on this continent are supposed to be found, and his presence in America at a very remote date, comparatively speaking, is held by many observers to be clearly established. In many places the submergence of the surface beneath the sea is clearly proved by the presence of marine shells in beds or local deposits, or by the finding of the bones of the seal, of fish, or other forms of marine life; but the fact that very large areas of these clays furnish, at the present day, no trace of these remains, shews clearly that their absence in these deposits must not be taken as conclusive that these were not deposited under marine conditions equally with the beds which carry these organisms. So also the presence of characteristic sea beaches, composed of well rounded water-worn stones, at elevations of hundreds of feet above present sea level and far removed from the present ocean limit, establishes clearly the fact that at one time the salt sea spread over a much more widely extended area than it now occupies. Thus in the rear of the village of Quyon and four miles north of the Ottawa river several of these perfectly defined beaches can be recognized, their pavements of well rounded water-worn stones, curving in exactly the same manner as those now seen along the shores of the many bays of the Atlantic coast. Some of these well defined shore lines have been recognized along mountain slopes at elevations of hundreds of feet above the sea at various places throughout Northern and Eastern America. Near home probably one of the most interesting of these old beaches may be seen on the Rigaud mountain on the south side of the Lake of Two Mountains, which is the expansion of the Ottawa River, a short distance above its junction with the St. Lawrence. The mountain rises from the village of Rigaud, which nestles at its foot, to a height of about 750 feet above the river, the highest point being at its south-west extremity. From this point the mountain extends north-easterly in a long ridge, the elevation in rear of Rigaud village being about 500 feet. Along the summit of this, scattered boulders of limestone, gneiss and syenite from the Laurentian range north of the Ottawa are seen, but further down along the north-west slope of the ridge and almost in rear of the cemetery, a curious deposit of well rounded water-worn

stones occurs, which has a very considerable extent. In places the soil and thin forest growth has been removed and the rounded stones are laid bare sometimes over a space of several acres. These shew low terrace like ridges of eight or ten feet high, the whole deposit sloping towards the valley of the Rivière à la Graise which flows past the northern flank of the mountain. The rocks comprising this curious deposit, which is known locally as the *Devil's Field*, are nearly all of reddish syenite often composed almost entirely of red felspar, with others of flesh-red felsite and porphyry, and a few of quartzite, the latter belonging presumably to some portion of the Laurentian, which is found on the north side of the Ottawa River. The bulk of the syenite and felsite rock is from the mass of Rigaud mountain itself. This deposit extends for several hundred yards along the north face of the mountain, and has a depth of from ten to twenty feet, though the bottom has not apparently been reached, but lower down the mountain side the deposits become finer, being largely coarse gravel and sand. There is every probability that this curious deposit marks an old shore or beach of the time subsequent to the glacial period. The locality has been briefly described in *Geo'l. Can.* 1863, p. 896, and is well worthy a visit from any one interested in the subject of glacial geology.

That the surface of the country was below the sea level at this period is clearly shewn by the presence of marine shells in extensive deposits of blue clay which is widespread throughout the valley of the Ottawa River. Along the streams flowing from the north, as the Rouge, Du Lievre, Gatineau, etc., it has been recognized for nearly 100 mile from their juncture with the main stream. Frequently the clay deposits are covered by a mantle of sand often of considerable thickness. That the greater part of these clays are of marine origin is shewn by the finding of marine shells at elevations of 450 and 500 feet above present sea level at various points throughout the area. Along most of the rivers throughout this section a succession of terraces occurs, some of which along the upper part of the Rouge River are 1000 feet above the sea level. The distribution of the clays and sands throughout the northern area is very extensive; great areas as the Kazubazua plains embracing many square miles on which the soil is nearly pure sand, the vegetable growth consisting of small pine and blueberry

bushes ; and these sandy deposits can be found for long distances north, probably to near the height of land. In deep cut sections the blue clay frequently appears in which, however, the marine organisms have not yet been found, and the mode of deposition can not therefore be distinctly affirmed. Marine shells have been found as far west as Bryson, on the Ottawa, and nodules like those of Green's Creek on Coulonge Lake 365 feet above sea level. It is thus clear that a very considerable part of the Ottawa basin has been submerged.

A very interesting point in connection with this question is the distribution of Laurentian boulders along the flanks of the mountain range which, traverses the eastern townships of Quebec, seventy to 100 miles south-east of the St. Lawrence River. Here on the slopes of the hill ranges which extend north-eastward from the Vermont boundary to Gaspé, scattered masses of gneiss and limestone from the Laurentian hills north of that river are found at elevations of 1000 to 1400 feet above the sea level. In the great valley between this ridge and the highland along the boundary of Northern Maine the drift has also been very extensive, clays and sand occurring at elevations of 800 to 1000 feet. This country has undoubtedly been submerged, and Hitchcock and others have recorded the presence of beaches and terraces along the mountains of Vermont and New Hampshire at elevations of 2000 to over 2500 feet. The whole question of submergence and elevation is of very great interest and the gradual accumulation of facts from many widely scattered points should, if properly interpreted, give us much reliable information when properly correlated. Unfortunately, however, the peculiarities of many minds prevent these facts from being regarded from the same stand point, so that while one sees in these phenomena the clearest evidence of submergence and sea beaches another sees only elevation and terminal moraines.

There is yet a large field of study along the Ottawa River and the many tributary streams for those who are interested in this branch of scientific investigation, and many points, a few years ago accessible only with difficulty and much expense, can now be readily reached by the various lines of railway lately constructed. There is no doubt therefore that fresh facts bearing on the question will rapidly accumulate and the vexed question of submergence or continental glaciation may be satisfactorily settled in the not far distant future.

## EXCURSION TO GALETTA.

The last excursion of the season was held on Saturday, the 15th of September, to Galetta, on the Ottawa Arnprior and Parry Sound Ry. This excursion, notwithstanding that it was not largely attended, was decidedly a successful one. The day, although rather overcast early in the morning, turned out all that could be asked by the most fastidious. The locality visited, is one of great natural beauty, and the arrangements made by the acting-president, Mr. Shutt, were such as to call forth the grateful appreciation of all who were fortunate enough to participate in this pleasant outing. On arriving at the Galetta station the party was met by Messrs. George and Galetta Whyte, and escorted to the town hall, which had been kindly placed at the disposal of the excursionists. Here, without further delay, the lunch baskets were deposited, and the Naturalists divided themselves into two parties, one under the guidance of Dr. H. M. Ami went off to examine the rocks and collect geological specimens. The larger number, led by Mr. Galetta Whyte, and with Mr. Robert Whyte and Mr. Fletcher as botanical leaders, and Dr. Ells as geologist, started off by a circuitous path through the woods, towards Dingley's Syne. Many specimens of interest were collected on the way. Wood-ducks in large numbers and a few "partridge" were seen around the frequent ponds. When the Syne was reached most of the party were glad to rest in the shade, after their hot walk. They were not, however, idle, and the stream furnished many nice specimens of freshwater shells and water plants. Upon returning to the village again an hour was profitably spent in refreshing the inner man, and at 2:30 all were called together to hear the addresses of the leaders, which were delivered in Mr. Whyte's beautiful grove, close to the village.

Galetta is a thriving village about thirty miles from Ottawa, on the south and east sides of the Mississippi River. There are several pretty houses, a good store, a grist mill and a woollen factory. A notable feature of the locality is the magnificent water power, which has only to some extent, as yet, been made use. For some distance above and below the village the river is rapid and cut up by most picturesque chutes or falls, overhung by tree-laden banks. A mile distant, on the top of the hill is the comfortable homestead of Mr. Charles Mohr, well known throughout the district for his hospitality.

The party having assembled and taken their places on the comfortable seats arranged in the grove, were called to order by Mr. Shutt, who congratulated those present on the success of the day, and then called on Dr. H. M. Ami, the geological leader, for the first address. The doctor spoke as follows :

The various geologic formations met can all be classified under two heads, viz : I. *Archæan* ; II. *Post-Tertiary* or Pleistocene.

1. *Archæan System*. Crystalline limestones constitute the most prevalent rock at Galetta. They are for the most part light-coloured and coarsely crystalline, oftentimes assuming a decided coarsely saccharoidal texture. This rock weathers dark, chiefly owing to the growth of lichens, &c., and has been considerably used in the manufacture of lime for local use. On examination the limestone is seen to contain minute scales or crystals of mica, which are at times more extensively developed and form masses of rock in which mica predominates. Graphite or plumbago and iron pyrites also occur here and there in small quantities. Chondrodite is also present in the shape of amber-coloured crystals. This limestone thus would be a chondrodite limestone. The limestone is traversed by numerous dykes of what appears to be a true syenite or hornblende granite. At times this rock occurs as a homogeneous paste with orthoclase felspar, quartz and hornblende, in about equal proportions, at other times the felspar and hornblende are separated and occur in layers, the hornblende forming the line of weakness in a vein, then next to this orthoclase felspar, then the homogeneous combination of the two with a resinous gray-coloured syenite. Galena, wollastonite, graphite, calcite, and mica, are associated with the crystalline limestone.

2. *POST TERTIARY*.—Formations belonging to the glacial epoch, to the later marine period and even to the still later period of elevation are evident at Galetta. Boulder clays overlying the glaciated and rounded hills, which are decidedly "moutonnees," are in turn capped by marine gravels and clays and these to-day afford the rich soil of the farms in the locality. Erratics may also be seen scattered in various directions, some of them nearly ten feet in diameter, these indicate a period when the Ottawa Valley was submerged and floating and shore ice were amongst the agencies at work in transporting the boulders.

All were much pleased with Dr. Ami's entertaining and instructive address.

Mr. Fletcher was then called upon, and spoke of some of the more interesting objects observed during the day. He showed specimens of ten different species of bivalves collected in half an hour at the Snye, and explained the formation of the shells of mollusks, the development from the egg and the changes gone through in the course of growth. He also spoke on some of the aquatic insects collected, paying particular attention to Caddis flies and a beetle, *Psephenus lecontei*, the interesting larva of which had been found in numbers under stones in the river.

The last speaker was Mr. Robt. Whyte, who is always listened to gladly by members of the club. He spoke in his usual entertaining manner, on the plants collected, and being in particularly good form on this occasion, the time for departure arrived all too soon, and there were many regrets that he could not have spoken longer upon some of the tempting specimens that he exhibited. Among the plants treated of, the following may be mentioned:—*Valisneria spiralis*, the "water celery" eaten so greedily by the Canvas-back and other wild ducks. The remarkable mode of fertilization of which was explained. *Shepherdia Canadensis*, showing the flower buds already formed for next spring also some thistles and asters which formed a conspicuous feature of the landscape, as well as some other composités, *Impatiens fulva* with its cleistogamous fertile flowers, the cardinal flower and many other woodland beauties too numerous to mention.

At 3:20 the speaking had to be stopped for the party to go to the train. At 4:30 the city was reached and all returned well satisfied with one of the most pleasant excursions the club has held this season. Great praise was accorded Mr. Shutt for the trouble he took in looking after everyone's comfort and the excellent manner in which he managed everything during the day. Mr. Ebbs of the C. A. R. and the polite conductor of the train, Mr. Roberts, were also gratefully thanked for their successful efforts to make everything as convenient and agreeable as possible for the party.

## BOTANY.

Edited by JOHN CRAIG.

POTATO ROT.—The advantages of spraying potatoes with the Bordeaux mixture for the prevention of potato rot are well shown on the experimental plots now being dug at the Central Experimental Farm. The dry weather which prevailed throughout August and in the beginning of September gave conditions very unfavourable for the development of the parasitic fungus (*Phytophthora infestans*, DeBy.), which causes potatoes to rot; but the advantage, to those plants of which the foliage was kept green for some three or four weeks longer than on the untreated plots, is plainly shown by the far larger crop and the much better tubers. The reason of this is, of course, quite plain. On the untreated plots the leaves—the starch-making organs of the plant—were destroyed by the potato rust (which is merely another form of *P. infestans*) just at the time when they were required to collect and manufacture starch to be afterwards stored up in the tubers. In the case of the treated plants, on the other hand, these organs were preserved by the application of Bordeaux mixture and kept on performing their proper functions for another month, at the time of the year when this was of most importance to the crop; moreover, had the weather been wet during August and September it is probable that, not only would there have been a difference in the size of the tubers on the untreated plots, and consequently in the number of bushels reaped, but a large proportion of these would have been rotten. J. F.

SPRAYING TO PREVENT FUNGUS DISEASES.—Much has been said and written upon this subject since the practice was recommended some six years ago. Much remains to be learned, but great progress has been made, and the orchardist of the future will view spraying to prevent fungous and insect attacks in the same light, as bearing upon the success of his fruit crop, as the intelligent grower of to-day does the important operations of cultivating and manuring.

Very satisfactory results have been attained by the horticulturist of the Experimental Farm in treating apples and pears for *Fusicladium dendriticum* “scab” or “spot”, and *Monilia fructigena* “soft rot” on plums and cherries. A comprehensive series of experiments was

planned and carried out with the co-operation of the fruit growers of the St. Catharines and Grimsby districts. Copper Sulphate, 1 lb. to 25 gallons of water, was used for the early treatment before the foliage appeared, this was followed with three applications of dilute Bordeaux mixture to which paris green was added for the prevention of Codling Moth attack.

In apples and pears the results in quantity of fruit are sufficiently marked as to be readily recorded by means of photographs. Wherever the foliage was preserved, the fruit is of course larger, and of fine quality and appearance. Fruit growers are much encouraged with the results. J. C.

VIRGINIA CREEPER.—It is not generally recognized among Horticulturists and nurserymen that there are two varieties of the Virginia Creeper (*Ampelopsis, quinquefolia*.) They are identical in every respect except in the manner of attaching themselves to the object over which they climb. The type is supplied like the grape vine with tendrils which twine round string or wire supports or become wedged in the crevices of rocks; on a smooth surface, as a brick wall however, it is helpless. Not so its kindred variety, which is distinguished from it by being provided with little disks or suckers at the tips of the tendrils and by means of which it is enabled like its cousin the "Japanese Ivy," to scale the smoothest surface. At this season of the year the crimson drapery of its leaves is very beautiful on grey stone walls. Both varieties are found wild, and can be multiplied by layers or cuttings. J. C.

ASTER NOVÆ-ANGLIÆ, L.—In the October number of the OTTAWA NATURALIST for 1892, mention was made of a beautiful variety of the New England Michaelmas Daisy, sent from Toronto by Dr. J. E. White, the flowers of which varied from pale mauve to deep lilac. This plant has been grown in the perennial border of the Botanic garden, at the Experimental Farm, and is now in full flower. Growing with it, are also magnificent plants of the type of the species with purple flowers and of the var *roseus*, these were also received at the same time from Dr. White, who collected the roots at Toronto.

*A. Novæ-Angliæ*, L. var *roseus*, Gray, is one of the most attractive plants in the border forming a large bush five feet high and three feet through, a mass of lovely rose-purple flowers. This is undoubtedly one

of the most desirable of all of our wild flowers for cultivation in gardens and will certainly become commercial before long.

ASTER MULTIFLORUS, Ait.—Fine specimens of this species are also now to be seen in full flower in the Botanic garden. The profusion of pure white flowers make this Michaelmas Daisy also a very desirable late-flowering garden plant. The roots were received from Toronto and Manitoba.

## GEOLOGY.

Edited by DR. R. W. ELLS.

1. THE AGE OF THE NIAGARA RIVER.—There is still considerable diversity of opinion as to the probable age of the Niagara river. In *American Geologist* for September, Warren Upham computes the age of the Niagara River at 7,000 years (see p. 199); whilst Dr. Spencer places the same at 32,000 years.

2. MOUNT ST. ELIAS.—It is certainly gratifying to hear that the results of recent observations on the Alaskan boundary have proved this volcanic peak to be in British Columbia and not in Alaska. There are several peaks in that region which are higher than St. Elias, whose summit touches the clouds at 18,000 feet, amongst these is Mt. Logan, (called in honour of Sir Wm. Logan) the highest peak in North America. The altitude of Mt. Logan is 19,685 feet above the sea.

3. DEATH OF GEORGE H. WILLIAMS.—It is with feelings of deep sorrow that we have to chronicle the death of one of the foremost men in the ranks of geological science on this continent. In the August number of the *American Geologist*, p. 136, there is a brief obituary notice which is here given:—

“George Huntingdon Williams, Professor of Inorganic Geology in Johns Hopkins University and Vice-President of the Geological Society of America, died of typhoid fever, at his father's house, Utica, N. Y., July 12th, aged 38. Prof. Williams graduated from Amherst in 1878, and studied under Rosenbusch at Heidelberg, where he took the degree of Doctor of Philosophy, in 1882; the next year he became connected with Johns Hopkins and was associate professor there from 1885 to 1892, when he was appointed to the chair he held at his death. A number of the younger geologists of the country have studied under

him, and to them, as well as to all who knew him, the news of his death comes with special sadness."

Latterly Dr. Williams devoted special attention to the petrography of the rocks from the volcanic regions of America. He has contributed to science a large number of useful papers on various topics, a list of which will shortly be published in the *American Geologist*. With a number of our Canadian geologists Dr. Williams was intimately associated, not only by the nature of his studies, but also by his geniality and uniform kindness. A great gloom is certainly cast by his death over the prospective meeting of the Geological Society of America at Baltimore, as his absence will be more than strongly felt. H. M. A.

4. NEPHELINE SYENITE IN ONTARIO. In the *American Journal of Science* 3, Vol. XLVIII, pp. 10-16, July, 1894, Dr. Adams, Logan Professor of Geology and Palæontology at McGill University, contributes an article entitled "On the occurrence of a large area of Nepheline Syenite, in the Township of Dungannon, Ontario." The region in question is there described as one in the midst of Laurentian rocks, and it is stated that this is the first discovery of Nepheline Syenite in the Laurentian System of Canada. This adds another to the list of the few localities in the world where Nepheline Syenite occurs. The Mount Royal outcrops of this interesting Rock of probable Devonian age, are well known and need not be referred to here.

The fact that this rock penetrates and cuts newer but palæozoic strata at Montreal and elsewhere, would lead us to look for outcrops of similar age, (right in the heart of the areas coloured Laurentian on our geological maps.

It is evident, however, that if the Nepheline Syenites of Mount Royal, Montreal, Quebec, are intruded through Cambro-Silurian Strata—they must also cut underlying Laurentian or Archæan rocks, and similar syenites ought to be looked for in Laurentian areas not overlain by palæozoic rocks. H. M. AML.

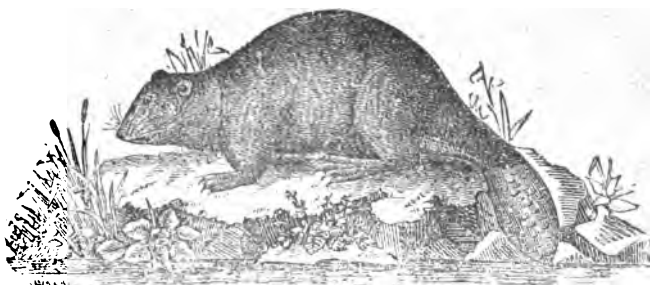
#### WINTER SOIREEES.

The soirée committee is now preparing the programme for the winter meetings. Any members who wish to submit papers or short notes, will oblige by sending in their titles as soon as possible.

November, 1894.

THE  
OTTAWA NATURALIST.

VOLUME VIII. No. 8.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ARBOIT, PRINTERS, 48 RIDEAU STREET.

Issued November 2nd, 1894.

Published Monthly at \$1.00 per annum.

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## MARVELS OF COLOUR IN THE ANIMAL WORLD.

A very interesting and instructive popular science lecture was delivered by Prof. Prince, Commissioner of Fisheries, in St. James' Hall, under the auspices of the "United King's Daughters," on the 26th March.

The Chairman, Sir Charles Hibbert Tupper, K.C.M.G., introduced the lecturer in his usual happy manner. The lecturer, after explaining the decomposition of light, went on to show that white animals and silvery creatures, like fishes, illustrated specular reflection. Striated surfaces broke up sunlight into prismatic colours, and produced in the feathers of birds, wing-cases of insects, pearly shells, etc., most gorgeous hues. Similar tints might be due to what the physicist calls "thin plates," instances of which occur in jelly-fishes and many glassy marine animals. One of the most frequent causes of colour was pigments or actual colouring matter in the tissues, in the skin, hair, or feathers. Three forms of pigments might be distinguished, viz: minute corpuscles, capable of expansion and contraction and usually stellate in shape, or larger masses called chromatophores, with muscle and nerve supply and controlled by the optic ganglion or, finally, a fluid bathing the tissues in the form of a dye. External conditions affected the pigment, the coloured particles altering their shape, and quickly changing the colour of the skin, as in the chameleon.

Most interesting examples of colour were found in very young animals. By studying them we gained information about adult colours. Animals are usually colourless in the earliest days of their existence. Amongst worms, insects, crustaceans, ascidians, fishes, reptiles, birds and even the highest animals there is a time when they are colourless and wormlike in form. The surface of the sea is a vast nursery for young creatures of various kinds exhibiting these characters. When, at a certain stage, colour appears, it is found to correspond to the form of the body. It occurs as repeated stripes or patches. A young cod, for instance, when three days old, is an insignificant eel-like creature, transparent and with four bold stripes of black on the sides of the body. These stripes later break up into spots. This spotted or striped character prevails amongst myriads of young animals. Wild pigs when young are

striped, the lynx is spotted, the lion-cub is spotted: but these marks disappear. They are of no use and simply persist as an ancestral landmark in each generation. In some striped creatures, the zebra, tiger and leopard, these external marks have proved of use and have persisted. Passing from ancestral coloration, Professor Prince referred to colours due to food, instancing the green oyster and the cochineal insect. Other colours may be called physiological, like the red or green colour of worms due to the hue of the blood. We have also emotional (cuttlefish); aesthetic (sex colours of birds, etc.,) and seasonal coloration. The stoat and hare turning white in winter illustrate the last. Parasitism furnishes strange instances, the green sloth owes its colour to minute algae which clothe the coarse grey hairs of that animal. Environment is most potent in causing animals to assume the colours of their surroundings. Insects afford striking cases. Strikingly tinted creatures such as the skunk, amongst quadrupeds, and the wasp among insects, exhibit warning colours. Mimicry is of great interest and there are many types, the most interesting being that of harmless insects mimicking poisonous or disagreeable kinds. Lastly, many colours appear, in our present state of knowledge, to have no useful purpose, and must be classed as indifferent. Interior organs and membranes are coloured in various ways for which no explanation is at hand. Why should the chimpanzee possess a palate of a bright rose colour, and the interior of the orang's mouth be black as ink? Much still remains to be done in this subject, and few subjects present more facts curious and interesting in themselves but also of far-reaching significance.

On conclusion a vote of thanks was moved by His Excellency the Governor General, who congratulated the Chairman upon having been able to secure the services of such an able man as the lecturer to discharge the duties which had been assigned to him by the Department of Marine and Fisheries. The motion was seconded by Sir James Grant, carried unanimously, and very suitably acknowledged by the lecturer, who then moved a very hearty vote of thanks to the Chairman, which was seconded by Dr. Sweetland.

## ENTOMOLOGY.

Edited by J. FLETCHER.

THE SUMACH GALL.—Fine specimens of the curious and pretty gall which is sometimes found beneath the leaves of the Stag's horn Sumach, have been sent from Nictaux Falls, Annapolis county, N.S., by Prof. A. H. Mackay. This gall, which varies very much in size and shape, but is generally somewhat spherical and from  $\frac{1}{2}$  to 1 inch in diameter, is formed by one of the gall-making plant lice beneath the leaves of both the Stag's horn and Smooth Sumach. The colour is the same as that of the leaves, and like the latter, turns to a brilliant scarlet in the autumn.

In the American Entomologist for 1869, Prof. Walsh says:—"Early in spring, as we have been informed by Dr. Manlius, each gall contains but a single wingless mother louse with numerous larvæ." At this time of the year, when the galls drop to the ground, they are found to be little more than hollow bladders filled with enormous numbers of winged plant lice. Numerous specimens were collected at Kirk's Ferry last year and attracted much attention; some of the largest galls resembled small tomatoes. The insect which causes these curious excrescences is known by the name of *Pemphigus rhois*, and belongs to the Aphidæ or Plant lice.

EACLES IMPERIALIS.—I have received a specimen of this large and beautiful moth from Mr. T. W. Ramm, of Ross Mount, Northumberland county, Ontario, who writes as follows concerning its capture:—"I am not certain of the date, but it was at the end of June or the beginning of July, when I found two specimens of the Imperial Moth mated on a piece of an old log, on the side of the Port Hope and Peterboro gravel road, on Lot 35 in the 7th Concession of the Township of Hamilton. This is the last Lot, and the Concessions here number from the shore of Lake Ontario and are one mile and a quarter each. I had never seen the moth before, that I remember; in a residence here of 32 years."

CATOCALA RELICTA.—Mr. Ramm also sent, under date of Sept. 18th, a specimen of the above named handsome moth, which he had taken two days before. The colouring of this moth is chiefly white, with a few black marks, and Capt. Geddes has recorded an interesting habit, with regard to this species, of settling on white trees or other white objects. He has taken several specimens at rest on the white

tomb stones in a grave yard. It has been found in this city upon white gate posts and fences.

ANISOTA VIRGINIENSIS, Dru. (*Dryocampa pellucida*, A. and S).—Three pairs of this striking and rather rare moth have been taken during the past season. One perfect pair was taken by Miss Susie Almon, at the first excursion of the club, and kindly given to the leaders. The other two pairs were taken by Mr. Harry May and Mr. Harrington at Hull.

#### NOTES ON THE CATFISH.

During the past few months I have been closely observing the habits of the Catfish in my Aquarium. I find that these fish, during the day, lie comparatively quiet on the bottom, scarcely noticing food, unless dropped immediately before them, when they languidly literally bolt it, and again assume perfect indifference. As evening approaches however, they commence to swim about, frequently rising to the surface and drawing in air. This evidently is not from the absence of air in the water, or from impurity in the latter, as the same habits are noticeable even when the water has been changed, just before dark. This, I think, settles the fact of their nocturnal habits. The exception is on the approach of wind or a storm, when the catfish becomes very restless, swimming about frantically with no apparent object, and as restless as the eel is under similar circumstances. The same habit has been noticed with the leech, and they thus become one of Nature's Barometers. Another curious feature might be mentioned, that when the Aquarium is exposed to continuous sunshine or bright light, the catfish assumes a light colour, the opposite being the case when in a dim light or darkened room. There is much yet to be observed in the habits of our fresh-water fish, of which we really know very little, from want of proper observation.

H. B. SMALL.

#### BOTANY.

HYPOPITYS LANUGINOSA, Nutt. Flowering specimens of this curious plant were collected at Kirk's Ferry, on 9th July last, by Mr. W. E. Saunders. This is the only place at which it has been found near Ottawa. J. F.

*CORALLORHIZA STRIATA*, Lindl. Several plants of this beautiful orchid were collected last spring at Beechwood, and in the woods at the back of Rideau Hall. The first specimen was found by the Hon. Archie Gordon. At the meeting of the Ottawa Electoral District Agricultural Society, on June 5th, a bunch of the flowers was exhibited which had been gathered from these woods by Master Symmes. The species is very rare in this locality having been found but once previously in the same wood. J. F.

*PODOSTEMON CERATOPHYLLUS*, Michx. One of the most interesting additions to our local flora, as well as to that of the Dominion, was made last August by Professor Macoun, in the discovery of large beds of the interesting River Weed. It was found growing on the bottom and creeping over the surface of the rocks in the rapids of Brigham's Creek, Hull, about 100 yards below the axe factory, and also further down the stream towards the Ottawa River. The description in Gray's Manual is an excellent one. There is only one species of the genus in Canada, which is a small ruddy or olivaceous plant of firm texture resembling a moss or sea-weed, which has no real roots, but is tenaciously attached to the bottom, loose stones, or other objects in the water, by fleshy disks. The leaves are rigid, dilated into a sheathing base with pointed stipules and above mostly forked into about 3 thread-like or linear lobes which are again divided once or twice. The flowers are very interesting, they are nearly sessile in a tubular sack-like involucre, and consist of two stamens, of which the filaments are united below, two sterile filaments, one on each side, and a stalked ovary which bears two awl-shaped stigmas. Flowers solitary and very numerous. The capsules are pedicellate, oval, 8 ribbed, 2-celled, 2-valved, seeds minute, very numerous on a thick persistent central placenta. J. F.

*PHRAGMITES COMMUNIS*, Trin. Specimens of this grass have been sent in by Mr. A. M. Campbell, of Perth, Ont., who was much struck with their beauty. He writes as follows:—"It is from the shores of Wicksteed Lake in the Temiscaming district. The Indian name for Wicksteed Lake is Shabasagi Lake, (river coming out on a point) and on the point where the inlet enters the lake grows this tall grass with its pampas-like plumes. I first saw this grass there last year, when we were surveying that lake. I also saw it in 1888 on the Lavase River, the

inlet of Lac Panache, District of Algoma. I cut specimens, this year, which measured 8 feet 6 inches in length and bore leaves 17 inches long. The stem was hollow and jointed like sugar cane; the joints were from two to eight inches in length. Towards the top the long, narrow, pointed leaves grew out of one side and the whole was surmounted by a tuft of purplish, oat-like seeds. On one specimen I noticed three tiers of aerial roots radiating from the first three joints above the root, there being one and a half inches between the first and second tiers, and four inches between the second and third. There were six roots radiating from each joint. It is certainly a very handsome plant and some of the ripe plumes were very silky and pretty. J. F.

This grass has also been collected by Rev. G. Bousfield, about three miles from Billings Bridge. The nearest point to Ottawa at which it had been previously collected was Casselman (30 miles).

**CYSTOPUS ON CAPSELLA.** It is a common habit now-a-days to look upon all fungi as injurious plants. A walk through a neglected garden at the present time will, however, discover one member of this large family doing good work for the cultivator. Shepherd's purse (*Capsella bursa pastoris*, Moench) is being freely destroyed by a form of mildew known as *Cystopus Candidus* (P) Lev. Unfortunately, however, this disease does not confine its attentions to Shepherd's purse, but is frequently found on other members of the mustard family and is also a common enemy of grasses when grown in badly drained soils. J.C.

**AFFINITY BETWEEN STOCK AND SCION.** In the development of new varieties the exact limit of possible hybridization is yet undefined; the same is true also when applied to the multiplication of the individual by the art of budding and grafting. There are in both instances—in the one the science, in the other the art—many gradations between failure and complete success.

In hybridizing plants, not nearly related, the pulp or receptacle of the fruit (seed) frequently or usually develops, but may, or often contains only infertile seed. Again, in the case of uniting the wood of two widely varying plants by grafting or budding, while the operation may appear to be entirely successful the first season, as judged by the growth of the scion, yet examination frequently reveals the fact that no real union of fibre has really taken place between the stock and the scion.

A case in point came under our notice recently in connection with experiments made in using the Bird Cherry (*Prunus Pennsylvanica*) as a stock upon which to grow cultivated forms. A number of varieties of the Morello, or sour type of cherry, were budded upon this stock, with every appearance of success the first year, many making a growth of three or four feet. The following season a few varieties made little progress and showed a tendency to break short off, under very slight pressure, at the point of union with the stock. Examination of the broken surface shows that there was no union of fibre, the surface being quite smooth, but merely by contact sufficiently close to admit the mechanical passage of sap. It also exhibits numerous lines or rays of fibre diverging regularly from the pith to the laburnum, and resembling the ordinary medullary rays but curiously multiplied. Under favorable circumstances, growth, or at least the life of the scion, might be maintained for some years by means of this connection, but vigour and longevity could not be expected. Bird Cherry as a stock shows a greater affinity for some varieties than for others.

While on this subject it might be stated that lilacs grafted on green ash (*Fraxinus viridis*) will grow vigorously the first season, but invariably die the second year. J. C.

#### GEOLOGICAL NOTES.

SAXICAVA SANDS AND GRAVELS AT CARP, ONTARIO. *Macoma fragilis*, Fabricius and *Saxicava rugosa*, Linnæus, both marine species of shells which are at the present day found living in great abundance in the Gulf of St. Lawrence and along the Labrador and general North Atlantic coast, were collected by me at Carp village station in the gravel pit immediately south of the station. Some fifteen feet of stratified sands and gravels are here exposed. The upper portion consists of coarse sands and gravels, of the ordinary type in this formation, whilst the lower portion reveals the presence of a considerable number of well rounded and water-worn pebbles; many of which vary in size from one inch to five inches in diameter. They are imbedded in a coarse matrix of sand and a number of accessories or impurities. These pebbles are for the most part derived from the crystalline limestone series of the Laurentian formations, probably of Archæan age, Pebbles of Chondro-

dite limestone are not infrequent, and are probably derived from the chondrodite limestones which lie to the north west of Carp station and the vicinity of Mississippi Lake.

H. M. AMI.

### PERSONAL NOTICES.

**MR. LEHMANN.** Two months ago we published a valuable and very readable paper on the manufacture of sugar from the cane, as practised in Louisiana, U.S.A., from the pen of Mr. Adolf Lehmann B.S.A., a member of the Club. As many of our readers know Mr. Lehmann personally, they will be interested to learn that he is now in Germany, prosecuting his studies in Agricultural Chemistry, with a view of taking the degree of Ph.D. For some years he was Assistant Chemist at the Central Experimental Farm, and in that capacity he did excellent work, all that he did being marked with thoroughness and ability. He then went to the Experiment Station at New Orleans, La., U.S.A., where, under the directorship of Dr. Stubbs he was especially engaged for a year and a half in the chemistry of sugar manufacture.

At Leipzig and Gottingen, Mr. Lehmann purposes making Bacteriology as applied to Agriculture, his special study. The Field Naturalists' Club wish him all success in his new field of labour. F.T.S.

**MR. CARRINGTON.** On October 17th some of the members of the Club had the pleasure of meeting Mr. J. T. Carrington, the well known English Naturalist who has just returned from Manitoba with Miss Winstone and Miss Flora Winstone, where they have been inspecting the working of the "Young Colonists' Aid Association." Mr Carrington is now the editor of that justly, very popular magazine, "Science Gossip" which has lately changed hands, and appears as a new series, in an improved form. Mr. Carrington was for 13 years editor of the English "Entomologist" and for many years was connected with the Natural History department of the *Field* newspaper. He is to have associated with him Mr. Edward Step, also an accomplished Naturalist. Mr Carrington made considerable collections of botanical specimens in different parts of Manitoba. While in Ottawa, the party visited the Departmental Buildings, the Experimental Farm and the Geological Survey. Mr. Carrington purposes to visit Canada again next spring, and we sincerely hope that it may be possible for him to attend one of our excursions. J. F.

## A PROPOSED PHOTOGRAPHIC SECTION.

For some time past there has been evinced on the part of several of our members, the desire to form a photographic section in the Club. To put such on a good and firm basis, it would be necessary to obtain the names of at least twenty members who would be willing to pay a small annual fee, a fund being required to defray the expense involved in providing a dark-room, the use of certain chemicals and some preliminary instructions in the art and practice of photography.

With the exception of Ottawa, all our large Canadian cities have a camera club. The clubs have a large membership of amateur photographers and are generally in a flourishing condition. To keep up the interest an annual exhibition of work by the members is made. There is certainly a need of such an organization here, and all things considered, it would seem the better plan to form a section of the Field-Naturalist's Club for this purpose, rather than a new society.

Photography is not only an interesting and fascinating recreation, but a most instructive study, a study specially applicable to investigation in the various fields of Natural History.

We shall be pleased if those members who are wishful to form such a section of the Club will send their names to the Secretary, Dr. H. M. Ami, Geological Survey Department, Ottawa.

## BOOK NOTICES.

One of the most interesting periodicals relating to scientific agriculture, which is received at this office, is the *Agricultural Gazette* of New South Wales. It is issued monthly by the Department of Agriculture of that colony; the subjects treated are always well prepared, carefully written and satisfactorily illustrated. While all departments are carefully edited, that relating to the field of botany is particularly interesting from an economic standpoint. We have before us the August number, and notice among the names of its contributors that of Dr. B. D. Halsted, Botanist and Horticulturist to the New Jersey Experiment Station. Dr. Halsted is known in Canada, but more especially in the United States as one of the foremost mycologists of the day, and an accepted authority upon cryptogamic botany.

"Club-Root of the Cabbage and its Allies" (*Plasmodiophora brassicae*, Wor.) is the text of Dr. Halsted's interesting article. The nature and history of the disease which causes the roots of cabbage to become distorted, and which belongs to one of the slime moulds, is clearly described, and the best course of treatment outlined. Some of the conclusions reached are as follows:—

"The malady is due to a microscopic parasite which infests the cells of the roots, causing them to become swollen and distorted."

"The spores of the fungus, upon the decay of the part affected, become scattered through the soil, and from thence the enemy enters the plant."

"The disease affects several plants of the cabbage family, including turnips, kale, radish, stock and candytuft."

Among weeds, shepherd's purse and hedge mustard are also infested.

"Preventive measures must be relied upon, for the affected parts of the plant are below ground, and not readily reached by any fungicide."

"If the crop is diseased, all refuse at harvest time of roots, stems, and leaves should be burned."

"All seedlings from hot-beds with signs of club-root should be destroyed, and if possible use only plants from beds in which there is no disease."

"Cabbage, kale, brussels sprouts, kohlrabi, turnips, or radishes should not follow each other on the same land if club-root is prevalent."

"Lime added to the land, 75 bushels per acre, has proved effective. It is possible that some commercial fertilizers may be found to check the trouble."

"Keep the land free from shepherd's purse and hedge mustard, and other weeds of the same family, as their roots become "clubbed" and thereby propagate the enemy."

Among other articles of interest in this readable pamphlet, is one on the possibility of utilizing a native, and hitherto noxious weed, known as "Paddy's Lucerne" or "Queensland Hemp" (*Sida rhombifolia*, Linn.), as a fibre plant. Another describes "A New South Wales Bitter Vine" (*Piptocalyx Moorei*, Oliv.), from which a drug of at present unknown properties is prepared.

The notes by consulting botanist J. H. Maiden "On Colonial Timber for Carriage-Building" are of much practical value, describing as they do the physical properties of many of the native woods, and giving their chief lines of usefulness. It is somewhat surprising to see the Gums (*Eucalyptus*) classed among hard woods, and recommended for cart and wheelwright's work, with the statement, that for such purposes there is "no timber to approach them." J. CRAIG.

#### WINTER MEETINGS.

The Soirée committee has almost completed the preparation of a programme for the course of evening meetings to be held during the winter, and it is promised that the Soirées will be exceptionally interesting. There will be a return in some measure to the procedure of the earlier years of the Club, and the course will be devoted entirely to natural history subjects. On December 6th it is proposed to hold a conversazione, when Dr. Dawson will deliver a brief inaugural address; the remainder of the evening being devoted to some interesting zoological subject. Then once a fortnight there will be evenings devoted respectively to Geology, Botany, Entomology, Conchology, Ornithology and Zoology. On each evening there will be two brief papers (not exceeding fifteen minutes) and the report of the leaders of the branch, with short notes which may be sent in by any member. Specimens will be exhibited to illustrate the proceedings, or when they are of exceptional interest. The committee again invites any member who may wish to contribute notes, or who desires to exhibit specimens, or otherwise assist in the meetings to communicate with Dr. Ellis as soon as possible. A complete programme will issue in good time. Ed.

#### JUMPING BEANS.

The Ottawa newspapers have recently had several notices of the arrival in the city of specimens of the so called "Mexican Jumping Seeds," and it may be of interest to give a brief description of what they really are. You all know the Codling Moth of the Apple, whose caterpillar injures and destroys so much fruit by making it wormy. Well the exact name of the appleworm is *Carpocapsa salitans*. The

plants infested by this insect in the United States are species of the genus *Sebastiana*, three in number, viz. *S. biocularis*, *S. palmeri* and *S. pringlei*, and it is found in California as well as in Mexico. The seeds in which the little grubs live, are about two-fifths of an inch long and subtriangular in shape; the two flat sides (where the seeds have pressed against each other in the ovary) forming a wedge, with the outer side rounded. The grub having fed internally upon the seed until nothing but a thin coated cell remains, lines it with silk and uses it as a winter residence. Before pupating it provides a way for it to escape from its prison when it becomes a moth, by partially cutting a circular hole through the wall and arranging an almost invisible trap-door which may be readily pushed open from within. You have seen caterpillars lashing their bodies about when disturbed, and it is supposed that the jumping bean is knocked about by similar movements on the part of its inmate, who fastens the posterior extremity of his body firmly to the silken lining, and then dashes his head against the walls. By this means the seed may be rolled over or twisted violently around, or, aided by its shape, move about upon a flat surface in an apparently mysterious manner. The first specimen seen by me was one which Mr. Walter Odell kindly brought to me last winter, but it had apparently jumped itself to death. There are known to entomologists, other species of insects which produce similar movements in seeds. A more complete account of the insect may be found in Prof. Lintner's Fourth Report on the Injurious and other Insects of the State of New York, 1888, pages 151-154. Ed.

NOTE.—The Treasurer, Mr. A. G. Kingston (Public Works Department), again requests the attention of members, who have not paid their subscription for the current year, to the clause in the Constitution, which enacts that such fees are *payable in advance*.

December, 1894.

THE  
\* OTTAWA NATURALIST \*

VOLUME VIII. No. 1. 9



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:

PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued December 22nd, 1894.

Published Monthly at \$1.00 per annum.

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## THE MAGNETIC NEEDLE.

By A. W. ELKINS, C.E., P.L.S., Lennoxville.

*(Read at the Autumn Meeting of the General Mining Association of the Province of Quebec, at Sherbrooke, Que., September 27th, 1894.)*

A slender bar of steel, charged with some of that mysterious, imponderable fluid or influence called magnetism, generally about five inches long and about one sixteenth of an inch thick, pointed or wedge-shaped at the ends, and provided at its centre with a cup-shaped piece of very hard metal, or precious stone, so arranged that the bar may freely turn upon a pivot, is essentially the simple little instrument known to-day the world over as the Magnetic Needle, which possesses the wonderful property of remaining in a direction, or of turning upon its centre until it assumes a direction, nearly North and South, and this provides data from which the direction of the geographic poles of the earth can be inferred with a fair degree of accuracy.

Such is the essential part of the instrument, which, for at least seven centuries, has been the greatest boon to navigators, and of inestimable service to explorers of unknown territory.

The early history of this simple but invaluable contrivance is lost in antiquity. It is thought that the Chinese were its inventors; and one authority states that the Emperor of Ho-Ang-Ti, marching with his army against the enemy, finding himself embarrassed by fog, constructed a chariot which indicated the South. This was in the year 2634 B.C., and it is supposed that the Magnetic Needle was referred to; but the first time that it was explicitly mentioned was in a Chinese dictionary finished A.D. 121. However, its use to navigators was probably not generally known till the middle of the twelfth century.

In order to bring forcibly before you some of the wonderful properties of the instrument, I will arrange a needle so that its extremities will turn towards the poles.

I have here a common knitting needle about seven inches long, to which I have imparted some of that subtle, imponderable fluid or influence, generally described as magnetism.

Attached to the centre of this bar of steel is a fine silk thread by which I suspend the bar.

It will be noted that one end immediately turns towards the North and the other towards the South.

That end towards the North is called the North pole of the needle, or more properly speaking, the North Seeking Pole, for I will show you that the kind of magnetism that is at the North seeking end of the needle is different from the magnetism which attracts it towards the magnetic North pole of the earth.

I have here another needle, similar to the one suspended before you ; this one has also the properties exhibited by the suspended one, that is, it is magnetized.

Now, upon bringing the North seeking pole of this needle towards the North seeking pole of that one which can turn freely, it is seen that the one I hold in my hand *repels* the other, and that the South end of one also repels the South end of the other ; but the North end of *either* attracts the South end of the other. Therefore the magnetism of the so-called North end of the needle is not the same as the magnetism of the North pole of the earth.

An ordinary magnetic needle costs about two dollars, but there are circumstances under which it may, and often has suddenly risen from this trifling value to the enormous sum of three or four millions of dollars.

For instance, in the case of one of our costly modern ships of war. Imagine one of these giants of the ocean cruising in a storm on a dangerous coast, the sun, moon and stars obscured by clouds and rain ; her commander unable to find anchorage must depend entirely upon that bar of steel for guidance, to save his ship and the lives of all on board.

Insignificant though the needle seems to be, there is no known substitute for it, under conditions such as I have named.

Though the value of the Magnetic Needle cannot be over-estimated, it is subject to changes, or influences, which are not perfectly understood and which at times cannot be successfully guarded against.

It is therefore necessary to use it, or to follow it, very cautiously, otherwise serious consequences might result.

The magnetic poles of the earth are not identical with its geographic

poles, and this difference which is indicated by the angle contained by the astronomic and magnetic meridians, is called the Declination of the Needle ; which difference is not everywhere the same.

In this Eastern part of America the direction of Magnetic North is about sixteen degrees *West* of true North ; whereas in British Columbia, it is about twenty degrees *East* of North ; and this declination is continually changing, to the extent of about five minutes in a year, the North end of the needle now gradually moving towards the West, in this Eastern part of America.

It is therefore of primary importance that, before using in any section of the country, its direction be ascertained by astronomic observation.

It is likewise subject to another change, known as the diurnal variation, which deflects it from its usual course about twelve minutes in twenty-four hours, and must be taken into consideration when using it : the maximum variation occurring about 2 p.m., after which it slowly returns to its former position.

In these northern latitudes the North end of the needle is drawn downwards, the extent of the inclination varying in different locations even in the same latitude.

It has been ascertained that the North magnetic pole is situated in about latitude seventy degrees North and longitude ninety-six degrees forty-six minutes West, which is a little North West of Hudson's Bay, and not far from Chesterfield's inlet.

The *magnetic equator*, does not correspond at all points with the earth's equator, but it is a curved line, in places a number of degrees from the equator proper.

On the magnetic equator the needle remains in a horizontal position ; but in southern magnetic latitudes the South end is drawn downwards in the same way that the North end inclines in northern magnetic latitude.

In order to counteract this dipping, and to keep the Needle in a horizontal position, a sliding counterpoise is placed upon most needles. *Sliding* because, as the instrument, from long use or any other circumstance, loses its magnetism, the North end dips less.

I have spoken of the changes that take place with a greater or lesser degree of regularity ; there are others, sometimes very material, that cannot be accounted for and which require the constant watchfulness of the observer to detect. The greatest change of this unaccountable character, that has come under my personal observation, was a deflection of about forty-four minutes in eight or ten minutes of time. This was probably due to an electrical storm, which could not otherwise have been noticed.

The glass cover of the compass sometimes become charged with electricity, which causes the needle to *apparently stick* to the glass. This is of rather frequent occurrence. Wetting the glass immediately dispels the electricity.

Any state of the atmosphere in which electricity is an element, greatly effects the needle ; electricity and magnetism being, it would seem, almost the same ; the power of an electrical motor for mechanical purposes, being dependent on the magnetic force induced in iron by an electric coil surrounding it.

In many places a purely *local* attraction causes the needle to swerve from its general course, from five minutes to fourteen degrees, as noticed by myself during the twelve years I was actively engaged in surveying ; and instances have been recorded where this local swerving exceeded twenty-five degrees.

These considerable deflections of the Magnetic Needle in certain localities are doubtless due to large deposits of magnetic substances. In the vicinity of Thetford and Coleraine the iron ore that is disseminated through the serpentine and so-called asbestos, attracts the needle very sensibly.

Navigators have to contend with another perplexing source of error in compass reading, which is not easily overcome, particularly in these days when iron enters so largely into the construction of ships and that iron so used sometimes effects the needle to a serious extent, and from causes that are not always apparent.

It is a well known fact that iron, remaining long in one position, sometimes becomes magnetic, and it has been found that portions of iron ships become magnetic. Now, the action of unmagnetised iron,

which at the beginning of a voyage attracted the North end of the needle, should it become magnetic, would *repel* the North end, under certain obvious conditions.

I believe it was recently discovered that the needle was influenced to a dangerous extent on a Man-of-war by the side arms of a sentry who passed near the compass and whose bayonet had become magnetised by having been stored near the ship's dynamo.

All of these irregularities of the needle may be successfully guarded against in *fair weather*, by frequent astronomic observations, but such observations require special instruments, which are not always obtainable.

In the absence of astronomic observations, the correctness of the work in hand depends upon the skill of the observer and his knowledge of the *capricious pranks*, so to speak, of this little instrument, which, with all its faults, is so marvelously useful.

With a view to increase the accuracy of compass surveys, I several years ago, invented and obtained a patent, in the United States, upon a little instrument which I called an Improvement on Transit Compasses, and it obtained considerable favor among surveyors: in fact, some of my confreres were kind enough to say that they thought that my instrument would supercede the plain sight compass.

The instrument consists mainly of a compass, rigidly attached to the upper side of a telescope turning upon trunions in a bifurcated holder. It possesses many of the advantages of the heavy and expensive transit instrument, with the lightness and inexpensiveness of the compass, and it is therefore particularly desirable for surveys in places not easily accessible.

In ordinary so-called "line running" the surveyor would only use the needle at starting, after which required points in the great circle would be accurately determined by the use of the telescope, indicated in the cut of the instrument.

## FAUNA OTTAWAENSIS.

## HEMIPTERA.

By W. HAGUE HARRINGTON, F.R.S.C.

During the past season insects belonging to the Hemiptera appeared to be more than usually abundant, and this seemed especially to be the case with those belonging to the division Homoptera. Many species formerly scantily represented in my collections occurred in abundance. Altogether I collected one hundred species, of which about one-fourth prove to be additions to the lists previously published. Through the renewed kindness of Mr. Van Duzee I am able to furnish a list of these, although several of the species could not be named at present. In recording these species I take the liberty of adding, in some instances, Mr. Van Duzee's remarks on the specimens. I include also three additional species of *Aradus*, formerly sent to Mr. Van Duzee, and referred by him to Dr. Bergroth for determination.

## HETEROPTERA.

*Geocoris borealis*, *Dall.* Aug. 25th, Kettle Island.

*Melinna modesta*, *Uhl.* July 23rd, Hull; 28th, Kettle Island.

*Psallus* sp. July 8th, Hull, common. "No. 9 is very common here (Buffalo). I have sent examples to Dr. Uhler, which have come back unnamed."

*Plagiognathus obscurus*, *Uhl.* July, 8th, Hull, two specimens.

*Pilophorus amœmus*, *Uhl?* July 21st.

*CAPSIDÆ* sp. July 29th, Hull. New to Mr. Van Duzee.

*CAPSIDÆ* sp. Aug. 18th, Kettle Island. Also new to Mr. Van Duzee.

*CAPSIDÆ* sp. Aug. 18th and 25th, Kettle Island; common. A pretty species with red markings, which has received from Dr. Uhler the ms. name of *Neoborus lætus*. "No 7, I think, has never been described; the name was received from Dr. Uhler; it is common here on *Ligustrum*."

*Triphleps latulus*, *Reut?* Aug. 13th.

*Tripleps insidiosus*, Say. July 21st.

*Aradus tuberculifera*, Say. Two specimens.

*Aradus similis*, Say. Three specimens.

*Aradus quadrilineatus*, Say. Two specimens.

*Brachyrhynchus* sp. Two young individuals taken in May under a piece of wood on the island in the Mer Bleue.

#### HOMOPTERA.

*Thelia acuminata*, Fab. Aug. 14th. \*One specimen collected in the old race-course swamp. This interesting species is said by Mr. Van Duzee to be rare at Buffalo. It has also been recorded by him as occurring at Ridgeway, Ont.

*Phypia*? sp. near *nava* (Flata) Say. Aug. 5th, Russell's Grove, Hull. "No. 18 is a common form, but I cannot make it agree with any described species. It is certainly near *nava* Say."

*Liburnia Osborni*, Van D. Aug. 13th.

*Pediopsis* n. sp.? "No. 27, I think, is another new species."

*Tettigonia bifida*, Say. Aug. 1st, race-course; 12th, King's Mountain; 18th, Kettle Island. A very pretty insect striped with green and black.

*Platymetopius frontalis*, Van D.? July 8th and 22nd, Hull. "No. 41 is in some doubt; it looks much larger and blacker than *frontalis* is here, but it doubtless belongs to that species."

*Athysanus instabilis*, Van D. Aug. 29th, Race-course.

*Phelpsius irroratus*, Say. July 23rd, Kettle Island, two specimens.

*Scaphoideus jucundus*, Prov. July 18th, Kettle Island.

*Thamnotettix* n. sp.? July 18th, Hull. "No. 40 is a very interesting form, and is probably new; I have never seen anything like it before."

*Typhlocyba* sp. Aug. 5th and 19th, Hull. A pretty little yellow insect, with three transversal dark bands.

*Typhlocyba* sp. Aug. 14th, race-course; common. A pale green form.

*Typhlocyba* sp. Aug. 14th and 22nd, race-course; 18th and 25th, Kettle Island; common. Prettily marked with yellow and brown.

*Typhlocyba* sp. July 29th, Hull. A pale yellow species.

The following notes are added on species formerly recorded :—

*Scolops sulcipes*, *Say*. This species was recorded on the strength of an immature form, taken some years ago at Buckingham. A specimen was taken July 21st, while sweeping the small willows along the C. A. Ry. track, not far from Bank street. It is our most conspicuous example of the Fulgoridæ, and has the head produced in a long, up-curved horn.

*Bruchomorpha oculata*, *Newm.* This curious little insect was quite abundant during the last week of July and first week of August in borders of hay fields near Hull.

*Idiocerus alternatus*, *Fitch*. Very common, July and August.

*Tettigonia hieroglyphica*, *Say*. This pretty species was very abundant in the race-course, at Kettle Island, Hull and King's Mountain, in August.

*Diedrocephala novæboracensis*, *Fitch*. Very common in swamps.

*Thamnotettix ruricola*, *Fitch*. Also common in moist localities.

*Phelpsius incisus*, *Van D.* Several examples of this fine species were taken at Hull in August.

*Athysanus curtisii*, *Fitch*. Taken at Hull, Kettle Island and in race-course in July and August.

*Neurocolpus nubilus*, *Say*. Very abundant upon the flowers of Sumach on July 8th.

*Gargaphia tiliæ*, *Walsh*. Abundant on basswood in August.

## BOTANY.

Edited by John. Craig.

QUEBEC PLANTS.—In a collection of plants sent by Mr. N. K. Berg, who has spent the past season at Shipton in the Eastern Townships, the following interesting species were found—all of which were collected in the immediate neighbourhood of Danville, P.Q. *Vicia tetrasperma*, *Impatiens paleida*, *Houstonia cærulea*, *Sparganium minimum*, *Polygonum acre*, *Carex miliaris*, *C. torta*, *C. flava*, *Poa debilis*, *Glyceria elongata*.—J.F.

NATIVE GRASSES—I have received with much pleasure a beautiful collection of the native grasses of Central Ontario, from my honoured and talented correspondent, Mrs. Catharine Parr Traill, well known as

the author of many valuable and entertaining works upon the history of pioneer life and the wild plants of Canada. This collection comprises about thirty species collected during the past summer near Lakefield, on the islands of Stony Lake, and along the shores of the Otonabee. This remarkable and untiring lover of nature is now in her ninety-third year ; but her ardour seems to be still unabated, although she naively writes :

" I was only able to go over the more important islands, not being quite as strong for climbing the rugged dangerous rocks as formerly."

Worthy of note in this collection are *Deschampsia flexuosa* from Hurricane Point and Fairy Lake, *Panicum xanthophysum* from the islands of Minni-wa-wa, *Carex sychnocephala*, with *Carex tribuloides*, from the islands in Stony Lake.

We are also pleased to announce that Mrs. Traill is just about to issue another of her charming works on natural history under the attractive title of " Pearls and Pebbles," which we feel sure will be read with pleasure and profit by many of her fellow members of this club.—J. F.

CUSCUTA EPITHYMUM, VAR. trifolii.—About the first of October of this year, I found this plant in a clover field belonging to Mr. Wm. Finley, at Ingleside, about 10 miles from St. John, N.B. Only a small patch of the field was infested with the parasite (a space not more than ten feet square), and this near the side of a road. So thick was it, however, that not only the clover stems, (*Trifolium pratense*), but every available stalk, even to the blades of grass, were thickly twined with it. I pointed out to Mr. Finley the dangerous nature of the parasite (the first appearance so far as I am aware in the Province of New Brunswick), and he has since ploughed it under.

St. John, Oct. 22, 1894.

G. U. Hay.

AN ARBORETUM FOR ST. JOHN, N.B.—In the St. John, N.B., *Globe*, under date Oct. 20, 1894, appears a letter by Mr. G. U. Hay, F.R.S.C., under the above heading. In this letter it is stated that the local Horticultural Association has been most successful during the past two years in decorating the public squares and, further, that land has been purchased for a public park. Mr. Hay then makes the following valu-

able suggestion : "Would it not be a good plan to set apart a portion of this park for an arboretum with the modest intention at first of planting there the trees and shrubs of New Brunswick?" He estimates this could be accomplished in two or three years, and points out that part of the land secured is admirably adapted for the purpose, giving a fertile piece of meadow, a swamp and rocky ground. This plan would give the park a practical value in the eyes of manufacturers, and would interest all classes ; but its chief value would be from an educational standpoint. Students from the public schools could be taken there and receive practical instruction in forestry and botany. Mr. Hay concludes his letter as follows : "After the New Brunswick arboretum has become an accomplished fact, there might be added trees and shrubs from the same latitude in North America, Europe and Asia, such as may now be seen growing at the Experimental Farm, Ottawa. These would be valuable for comparison, and would serve to illustrate what trees valuable for industrial purposes could be transplanted with profit in this province.

We heartily approve of Mr. Hay's excellent suggestion and trust that he will be able to induce the local authorities to act upon it. We feel sure that the Botanical section of this Club will be pleased to do anything in their power in the way of helping with seeds and specimens, as many plants are common to both New Brunswick and Ontario.—J.F.

CONTRIBUTIONS FROM HERBARIUM OF GEOL. SURVEY OF CANADA. Can. Rec. Sc., Part I, January, 1894; Ibid, Part II, April, 1894. Montreal. (Extras.) James M. Macoun. We have just received the two parts of the above. They contain four and twelve pages, respectively, of printed matter giving interesting notes on the mode of occurrence and geographical distribution of the species which have been added to the "Flora of Canada" since the publication of Part V—"Catalogue of Canadian Plants" by Prof. John Macoun.

Not a few species and varieties have been discovered that have proved new to science. We are exceedingly pleased to see these and welcome their publication. The nature of these contributions is precisely in line with that which the members of the Council of the Ottawa Field Naturalists' Club have been desirous to publish in the Ottawa NATURALIST. More of such contributions to Natural Science field work are needed.—H. M. A.

## NEGLECTED POINTS.

*Reprinted from the Austin, Texas, Naturalist,*

If every naturalist were annually to keep a record of all that he sees, confining himself to the branch he most delights in, such proceedings would be of the greatest use both for reference in after years and for comparison with other records. All notes are useful sooner or later if properly kept, and many a little incident, trifling as it may seem at the time, might prove of great value in determining some question of the future. With the extension of settlement, animal life, in its natural state, rapidly disappears. Even is this manifest in the finny tribe, for certain species of fish which years ago abounded in some of our streams are now entirely extinct in those waters, owing to various causes attributable to man's encroachment on nature. Cutting down the forests has materially tended to cut off the old water supply, and creeks which half a century ago teemed with fish, have now dwindled to brooks with no facilities for their former inhabitants. The refuse of mills and factories has also contaminated the water, and indiscriminate slaughter, especially in spawning time, has done the rest. In the inland waters around Ottawa, Canada, several species of fish are recorded in lists published by the Natural History Society, of that place, in the year 1859, inhabiting streams which are now entirely dry, and if the records did not exist the idea of such fish having been there would be ridiculed. Records of annual observation would contribute to show the cause and the time of the extinction or driving away of certain fish. We all well know the causes to which the disappearance of land animals can be attributed, but it is not so in most cases with the denizens of the water, and I would call the attention of brother-naturalists to the importance of recording little facts for the enlightenment of those of the next generation.

The study of fish and of "animal life below the water," generally, is perhaps more neglected by the amateur naturalist than any other object, and yet it will be found, after once commencing it, most fascinating. I have often sat perfectly quiet beside a still pool or beside a shallow stream where at first no life appeared. Very soon an object darts out from under a stone or a log, either after its prey floating down,

or for sport on the gravelly bottom, or to bask in the sun. Presently others come out from out from their hiding places and a shoal of fish gather, which disappear as if by magic when a shadow is cast on the surface or a concussion by sound affects the water. Their habits and their pastimes (for fish apparently indulge in these) are very interesting. Chasing each other, darting to and fro, grubbing up the sand, rubbing against each other, and nest building (amongst some species) afford plenty of room for observation. Besides fish, other life is plentiful and affords scope for curiosity. It is astonishing what pleasure can be got out of even a shallow pool; and the writer hopes that calling attention to this will be the means of offering a new attraction in his brother-naturalists' outings.

H. B. SMALL, Ottawa, Canada.

### MICROSCOPICAL SOIREE.

The winter course of lectures was opened by a very pleasant evening in the Convocation Hall of the Normal School, for the use of which the Club is indebted to Dr. McCabe. Arrangements had been made by the Soiree Committee, to illustrate, by a number of fine microscopes, some specially selected objects of interest. The President, Dr. Dawson, opened the meeting by a suitable address, and touched briefly on the present position of the club and the work it was performing. Prof. Saunders followed by a concise and interesting account of "A Grain of Wheat," giving a synopsis of the history, growth and structure of this very important seed. Prof. Prince introduced the subject of Zoology, and made some observations upon the development of the brain, especially in connection with that of fishes. At the close of these brief addresses, meant only to introduce the subjects which had been chosen for illustration by slides, an hour was pleasantly devoted to gazing upon the wonders revealed by the various microscopes. Besides the illustrations presided over by Prof. Saunders and Prof. Prince, the subject of entomology was taken up by Prof. Whiteaves, and was illustrated by a large series of preparations. The thanks of the Club were tendered to Mr. W. Scott, who kindly installed, for the illumination of the microscopes, a beautiful line of electric lamps.—Ed.

## JUMPING BEANS; A CORRECTION.

The compositor in setting up my note on the Mexican jumping seeds unfortunately dropped three lines of the manuscript, and caused me to say "Well the exact name of the apple-worm is *Carpocapsa salitans*," and as the proof of this note (p. 125) was read hurriedly, after the rest of the November number had been revised, the error was overlooked. What I had written was as follows :—"Well the exact name of the apple-worm is *Carpocapsa pomonella*, and the motive power of the jumping bean is the grub of a near relative of the coddling-moth, which has been christened "*Carpocapsa saltitans*." The so-called "beans" also are not the seeds of the plant but the carpels. The ovary is three-celled, and each carpel contains but a single seed, which is entirely devoured by the grub, and the beans which we see are the empty carpels.—Ed.

## GEOLOGY.

Edited by Dr. R. W. Ells.

*The Cretaceous System in Canada.* Presidential address, Section IV, Royal Society of Canada, by J. F. Whiteaves, Montreal, November, 1893. This paper gives a comprehensive resume, to date, of the various researches and results obtained in the palaeontological investigations of the Cretaceous System in Canada. The first part of the address deals with the bibliography of the subject, twelve papers having been published before 1867 by various writers: Meek, Newberry, Shumard, Hector, Bauerman, Heer, Etheridge and Gabb having contributed to the literature in question. Here Mr. Whiteaves adds that: "With the birth of the new Dominion, however, the conditions were changed, and the seventeen annual reports published since 1867, with many special publications not included therein, will abundantly show how far the new obligations imposed upon its staff have been met." Since 1867 the knowledge of the rocks and the fauna and flora entombed in them has increased from year to year, until now we find that the Cretaceous rocks of Canada are as well, if not better, described and known as the rocks of any other epoch in geology. The stratigraphical relations of the various subdivisions of the Cretaceous rocks to each other and to the overlying newer or underlying older rocks have been described by Drs.

Selwyn, G. M. Dawson, R. Bell and J. W. Spencer, also by Messrs. James Richardson, R. G. McConnell and J. B. Tyrrell. Sir William Dawson has described the flora of the Cretaceous in Canada. Mr. Tyrrell, Dr. Dawson and Dr. Rüst have published papers on the Foraminifera and Radiolaria of the same rocks, whilst the great bulk of the fauna of the Cretaceous in Canada has been carefully described, figured and published by Mr. Whiteaves, Palæontologist and Zoologist to the Survey.

Without making a single reference to his own personal work in the elucidation and description of the fauna of the Cretaceous system of Canada, Mr. Whiteaves indicates the results thus far obtained, and sums them up as follows :—

#### FOSSIL PLANTS.

98	species from	Manitoba and the N. W. Territories.
52	do	the Rocky Mt. Region.
28	do	British Columbia.
1	do	the Yukon District.
<hr/>		
179	species.	

#### OTHER FOSSIL REMAINS.

“Before Confederation,” Mr. Whiteaves states, “only fifty-five species of fossils other than plant remains had been recognized or described from the Cretaceous of what we now call Canada, and of this number, thirty-two are from Vancouver Island and twenty-three from the North West Territories. We have now 358 species of animal remains from the undoubted Cretaceous rocks of the Dominion and 394 if we include the Laramie. They are summed up as follows :—

179	species from	Manitoba and the N. W. Territories.
13	do	the Rocky Mt. Region.
198	do	British Columbia.
7	do	the Yukon District.
<hr/>		
394	species as the total number from	Canada.

In his work on the Cretaceous fossils of Canada, Mr. Whiteaves has described all the material brought to him by the various exploratory surveys in the great North West and the glass cases on the north side

of the National Museum on Sussex street where the type specimens are preserved, are filled with those forms of animal and vegetable life which characterized the Cretaceous epoch. These will ever be, even in themselves, a monument to the industry and perseverance of Canada's palæontologist and zoologist.

H. M. AMI.

## ENTOMOLOGY.

Edited by J. Fletcher.

**TABANUS ATRATUS, Fab.**—A fine female of this large horse-fly has been handed to me by Mr. Stephen Bresee, who took it at Sutton, Province of Quebec. It has never yet been taken at Ottawa. J. F.

**DEBIS PORTLANDIA, Fab.**—A fresh specimen of this pretty and rare butter-fly was taken in the woods at Kirk's Ferry, P. Q., on the 9th July last by Mr. A. P. Saunders. Mr. Saunders did not notice particularly but thinks there were other specimens flying at the same time. J. F.

**THE BEE MOTH.**—Early in September I noticed just outside the entrance to one (the weakest) of my seven colonies of bees a dead grub, evidently one of the troublesome and injurious bee-moth grubs. I decided at once to examine the hive, out of which it had probably come, or had been carried by the bees, and on doing so soon found abundant evidence of where the intruder had been, which was almost in the centre of one of the brood frames. The bees, however, had proved equal to the emergency, and had succeeded in dislodging their natural enemy by cutting away the cells on both sides of the frame (which at this time held brood nearly ready to hatch), and had made an opening in the comb several inches in circumference. I may add that this took place shortly after I had very materially increased the strength of the hive by putting a number of young bees in it from another colony that was particularly strong. I think that perhaps the inference from this would be that so long as colonies of bees are in good condition as regards strength, even if attacked by the bee-moth, they will themselves as a rule get rid of their enemy, which they certainly do not appear to have sufficient energy to do when in a weak state.

PERCY H. SELWYN.

## PROGRAMME

1894—OTTAWA FIELD-NATURALISTS' CLUB.—1895.

*Free Lectures on Thursdays at 8 p.m. in Normal School.*

1894.

Dec. 6th. MICROSCOPICAL SOIREE.

Inaugural Address, - - - - - Dr. Geo. Dawson, *F.R.S.*  
A Grain of Wheat (*with illustrative sections*) - - - - -Entomology " " " Prof. Wm. Saunders, *F.R.S.C.*  
Zoology " " " J. F. Whiteaves, *F.R.S.C.*  
Prof. E. E. Prince, *B.A.*

Dec. 20th. GEOLOGY.

How Rocks are Formed (*illustrated with microscopic sections*)  
Dr. R. W. Ells, *F.R.S.C.*  
Crystals (*illustrated by models*) - - - - - W. F. Ferrier, *B.A. Sc.*

1895.

Jan. 17th. BOTANY.

From Flower to Fruit - - - - - J. Craig and R. B. Whyte

Jan. 31st. CONCHOLOGY.

The Present Condition of Canadian Conchology - - - - -  
Rev. G. W. Taylor, *F.R.S.C.*  
Canadian Shells - - - - - F. R. Latchford, *B.A.*  
How to Collect Them - - - - - Prof. J. Macoun, *F.R.S.C.*

Feb. 14th. ENTOMOLOGY.

How Insects Grow - - - - - James Fletcher, *F.R.S.C.*  
Some Insect Works - - - - - W. H. Harrington, *F.R.S.C.*

Feb. 28th. ZOOLOGY.

The Cow and Her Milk - - - - - Prof. J. W. Robertson  
Animal Commensalism, some features of exalted Parasitism (*with illustrations*) - - - - - Prof. E. E. Prince, *B.A.*

Mch. 14th. ORNITHOLOGY.

Feathers - - - - - W. A. D. Lees and A. G. Kingston

NOTE.—The Reports for each Branch will precede the reading of papers for the evening, and each paper will be illustrated as far as possible by specimens, microscopic slides or lantern. Any member who may have specimens or notes relating to the subjects under consideration is particularly requested to bring them to the meetings for discussion.

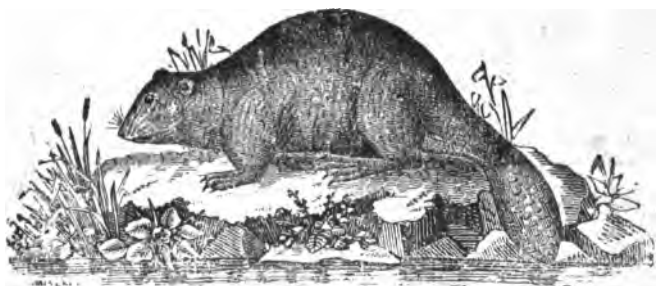
Mch. 19th. ANNUAL MEETING at 4.15 p.m.

Annual Meeting on Tuesday, March 19th at 4 15 p.m.

March, 1895.

THE  
\* OTTAWA NATURALIST \*

VOLUME VIII. No. 10.



THE BEAVER (*Castor Canadensis*, Kuhl).

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OTTAWA, CANADA:  
PAYNTER & ABBOTT, PRINTERS, 48 RIDEAU STREET.

Issued February 28th, 1895.

Published Monthly at \$1.00 per annum.

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*EXTRAS*—BILLINGS, W. R. Palæontology. An elementary lecture,  
pp. 11, 5c.

ELLIS, R. W. Asbestos ; its history, mode of occurrence and  
uses. pp. 24, 10c.

## THE PRESENT CONDITION OF CANADIAN CONCHOLOGY.

By REV. GEO. W. TAYLOR, F.R.S.C.

I am afraid that the title of my paper will hardly be justified by the paper itself, for to write fully and accurately on the present state of Conchological science in our Dominion would require a greater knowledge of the subject than I can lay claim to, and would involve a much more exhaustive research into the writings of others than it has been possible for me to make ; and, moreover, the time which I understand is allotted for this paper, viz., 15 minutes, is hardly sufficient for a very elaborate treatment of any subject.

What I shall attempt this evening, therefore, will simply be to give you, as shortly as possible, a summary of what has been published up to the present time with reference to Canadian shells, and then to point out, as best I can, what still remains to be done, and the particular way in which we, as a society of Field-Naturalists, and as individual students, may help to advance this important and interesting science.

As the Dominion of Canada extends from ocean to ocean, there are at least two distinct *marine* Faunas to be studied. There are also the very numerous *land* and *freshwater* mollusca, some confined to our eastern provinces, some to the western, while others range through the length and breadth of our territories.

No naturalist, except our fellow member the accomplished Zoologist to the Geological Survey of Canada, (Mr. Whiteaves), seems to have given special study to the subject of Canadian mollusca as a whole, and so for convenience sake I will in this paper divide my remarks into 3 parts, and will take

- (1.) The marine mollusca of the Atlantic Coasts.
- (2.) Those of the Pacific Coast.
- (3.) The land and freshwater shells of the Dominion.

Of necessity I must omit all reference to that very important part of conchology which treats of our fossil shells, and, in order to keep my paper within proper limits as to length, I will reserve bibliographical details for an appendix, in which I will try to enumerate all the most important papers that have appeared bearing upon our subject.

1. *Marine Mollusca of the Eastern and Northern Coasts of Canada.*

Many excellent treatises on the Zoology of the Bay of Fundy have been written, some by United States, and some by Canadian Naturalists. The boundary line between Canada and the Northern United States is, however, in no sense a zoological one, and consequently we shall find that the publications of the United States naturalists dealing with New England mollusca are of great service in the study of the fauna of New Brunswick and Nova Scotia.

First among such publications must be mentioned Stimpson's *Marine Invertebrata of the grand Manan* <sup>2</sup> (1854). In this classic work 117 species of mollusca are enumerated, all of which may be expected to be found (and the majority have already been found) in New Brunswick waters.

Next comes Gould's "Invertebrata of Massachusetts." In the original edition (1841), no references are made, I think, to Canadian localities, though many of our shells are noted and described, but in the second edition, (1870), edited and much enlarged by Dr. W. G. Binney, such references are frequent and the work is one that is almost indispensable to Canadian conchologists.

Prof. Verrill has written many papers of much importance to us,— 'On the invertebrata of Vinyard Sound,' <sup>12</sup> 'On Dredging Expeditions on the Coast of New England,' <sup>13</sup> 'On recent additions to the Marine Invertebrata of the North-Eastern Coast of America,' <sup>14</sup> (several papers), 'On the Cephalopods of the North-Eastern Coast of America,' <sup>15</sup> and so forth.

All these papers contain notices of Canadian localities, and most interesting notes on the habits and the nomenclature of our shells.

The above mentioned authors, though incidentally dealing with our mollusca, wrote with special reference to the United States Coasts, but the writer next referred to views the subject from a purely Canadian standpoint.

Mr. W. F. Ganong has several valuable papers in the *Bulletins of the Natural History Society of New Brunswick*. One paper, 'On the Zoology of the Invertebrate animals of Passamaquoddy Bay,' <sup>21</sup> was

published in the Bulletin (No. IV,) for 1884. A second, 'On Marine Invertebrata of L'Etang Harbour,'<sup>22</sup> in Bulletin V in the next year.

A third, and much more important paper<sup>23</sup> appeared in the Bulletin (No. VI), for 1886. This last contains the complete list of the Marine Mollusca of New Brunswick, (the Northern waters, Northumberland Straits and Bay Chaleur, are considered as well as Bay of Fundy), so far as it could be compiled at that date from the works of previous writers and from the author's own observations. The introduction contains much useful information and a full bibliography of the subject up to 1887.

Nearly 200 species are noticed in this paper, and additions to the list are made in Mr. Ganong's "Zoological Notes,"<sup>25</sup> published in the same series of Bulletins in 1890. Other papers by Ganong<sup>24</sup> and Winkley<sup>26</sup> are also published in these useful Bulletins and should be consulted.

For information regarding the Mollusca of the Gulf of St. Lawrence we must refer to the work of Mr. Whiteaves. His papers, of which four<sup>9-11</sup> on this branch of the subject are noted below, contain accounts of his own deep-sea dredgings, and though published more than 20 years ago are still most valuable, containing almost all we know of the shells of these waters. There are, however, other papers by Bell,<sup>3</sup> Dawson<sup>5</sup> and Packard,<sup>7</sup> that may be consulted with advantage.

I may also refer here to an interesting little note in the Report of the Geological Survey for 1878-9, on marine shells collected in the Hudson's Bay by Dr. Bell<sup>10</sup> who, I believe, collected additional marine specimens when with the Hudson's Bay Expedition in 1884, but no record of these has yet been published so far as I know.

Altogether from 200 to 250 species\* are noted, in the works I have referred to, as inhabiting the waters of our Atlantic coasts. No complete list of these has, however, been attempted, and for my own part I have to confess that my knowledge of eastern Canadian conchology is very imperfect. I have never enjoyed an opportunity of studying the eastern shells at home and am not well acquainted with the literature.

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\*NOTE—Exactly 240 names are contained in a manuscript list that I lately prepared for my own information.

It is very probable, therefore, that I have omitted some references of importance. It is probable too that some of you may be able to supply the omissions, in which case I shall be very grateful.

## II. *Marine Mollusca of the Pacific Coast of Canada.*

Passing now to the consideration of our western Marine shells I feel that I am on more familiar ground, for in the course of a residence of nearly 10 years in British Columbia I have been able to pay considerable attention to the study of the objects themselves and to the published observations of others.

As a starting point a student will naturally take the well known work of Dr. Carpenter, "The Mollusks of Western North America."<sup>27</sup>

This work is invaluable and is so thorough that though it was published 30 years ago, and though many naturalists have collected on the coast since Carpenter's day, only 81 marine species have been added to the list he gives of the B. C. mollusca.

Mr. Whiteaves has done much to extend our knowledge of western shells by the publication of four valuable papers. Three contain reports on collections made by Mr. James Richardson<sup>29</sup> and Dr. Geo. M. Dawson,<sup>30-31</sup> for the Geological Survey, at Victoria, Queen Charlotte Islands, and in various localities to the north and west of Vancouver Island.

These papers are still procurable and should be in the hands of every Canadian conchologist. The collections referred to are all on view in the museum of the Survey at Ottawa.

Last year Dr. C. F. Newcombe, of Victoria, compiled a very useful list of B. C. marine shells,<sup>32</sup> containing references to all Carpenter's and Whiteaves' localities and adding many others from his own very extensive observations. Dr. Newcombe also gives in the same paper a list of more than 100 works referring in some way to our western shells.

Still more recently there is a paper written by myself<sup>33</sup> and presented to the Royal Society of Canada, in May, 1894, and now being printed, in which is summarized all that I could write on the mollusca of western Canada. In this, the latest, I believe, contribution to western Canadian conchology, 284 marine species are enumerated. Thirty-two of these species appear also on eastern list.

### III. Land and Freshwater Shells of Canada.

So much has been written on the land and freshwater shells of Canada that it will be impossible for me to mention here all of the many useful papers that have appeared.

In the eastern provinces the writing of D'Urban,<sup>47, 48, & 56</sup> Bell,<sup>49</sup> Whiteaves,<sup>51, etc.</sup> Provancher,<sup>73</sup> Hanham,<sup>79</sup> and others have almost exhausted the subject.

Of the rich fauna of the Ottawa district we have accounts from the pens of Heron<sup>60</sup> and Latchford,<sup>61, etc.</sup> the last named I hope still hard at work.

Passing westward we find that Manitoba has been explored conchologically by Bell<sup>57</sup>, Dawson<sup>59</sup> and Christy<sup>71</sup>.

The mollusca of Alberta have been studied by myself in collections most kindly made for me by Mr. A. O. Wheeler and Mr. T. E. Bean, and which will be reported on in an early number of the OTTAWA NATURALIST. Forty-four species are now known to me from that province.

There is a short paper on shells from the Rocky Mountains in the *Nautilus* for December 1893.<sup>80</sup>

Finally for information as to the land and freshwater shells of our most western province (B.C.) I must refer you to my own paper on the land shells in the OTTAWA NATURALIST<sup>63</sup> (December, 1889), to a revised list of the same in the *Nautilus* December, 1891,<sup>76</sup> and to a list of freshwater species which is contained in my paper above referred to on the marine shells of B.C.

A preliminary check list of the land and freshwater shells of the whole Dominion, containing 244 names, was published in the OTTAWA NATURALIST for June 1892.<sup>66</sup>

This list may be brought fairly well up to date by omitting (as erroneous records or as synonyms) *Sph. patella*, *Sph. lenticulum*, *Pisid. occidentale* and 3 unnamed *Pisidia*, *Anod. angulata* and *ovata*, *Pomatiopsis lustrica*, *Limnæa emarginata*, *Physa triticea*, *Planorbis macrostomus* and *Billingsii*, and *Somatogyrus isogonus*, and by adding the following: *Sph. fabale* Prime and *Raymondi* J. G. Cooper, *Pis. aequilaterale* Prime, *Unio parvus* Barnes, *Novi-eboraci* Lea and *circulus* Lea, *Bythinella*

*tenuipes* Couper, *Somatogyrus subglobosus* Say, *Pleurocera pallidum* Lea, *Goniobasis translucens* Anthony and *Haldemani* Tryon, *Limnæa reflexa* Say, *Nuttalliana* Lea, *pallida* C. B. Adams, *galhana* Say and *bulimoides* Lea., *Physa vinosa* Gould, *Bulimus hordaceus* Lea, *Planorbis ammon* Gould and *dilatatus* Gould, *Ancylus fuscus* C. B. Adams, *Selenites Voyana*, Newcombe, *Limax flavus* Linn, *Arion fuscus* Müller, *Mesodon exoletus* Binney, *Triodopsis fallax* Say, *Pupa Blandi* and *Succinea Grosvenori* Lea. When these alterations have been made, our amended list will contain 258 names.

As will be seen from this very superficial review, the *literature* of Canadian Conchology is already quite voluminous. A student, however, needs something more than literature. To a beginner no aid is so acceptable as that offered by a well arranged museum.

I think we have a right to expect that in this respect our own national museum should supply all we can require. In this expectation, however, we shall be disappointed. The eastern marine shells are represented in the museum at Ottawa by a very incomplete series. The western collection, though very much better, is almost useless to the student who attempts to study it by himself, as in nearly all cases the names of the specimens are on the bottoms of the boxes containing them and consequently concealed from view. I am speaking of course of the collection as I saw it last, 16 months ago.

It must be pointed out that this defective labelling need not be a hindrance to any one really anxious to study the collection, as Mr. Whiteaves is always ready (at least this has been my experience) to open the cases for a bona fide student, and at the same time to give him the benefit of his own vast fund of information.

As to the land and freshwater shells in the Ottawa Museum there are very few indeed on exhibition. Though the officers of the Geological Survey have travelled through the length and breadth of the Dominion and collected extensively in many localities, the specimens they have brought together are still for the most part un-reported on, or at any rate the records are unpublished, and the specimens themselves are stored away in private cabinets and rooms.

I am perfectly aware that there is no space in the present museum

for the proper display of all the collections and I am therefore not reflecting on those who are in charge, but I may be permitted to express a hope that the day is not far distant when in a new museum building there will be provided adequate space for the proper exhibition of all our national collections.

The museums of McGill College and of the Natural History Society of Montreal I am sorry to say I have never seen, but they contain, I know, some valuable collections and together they must possess, I should think, the most complete series of Canadian shells in Canada.

Smaller collections are contained in the museums of the New Brunswick Natural History Society (at St. John) and the Provincial Government of B.C. at Victoria, the former collection being principally of eastern and the latter of western marine shells.

Of private collections of shells there are only very few. I am not acquainted with any conchologist possessing a collection of Canadian Atlantic shells in any sense complete. Of Pacific shells I know only of the collections of Dr. Newcombe and myself, both nearly perfect as to native species. Of land and freshwater shells of Canada it is probable that the collections of Messrs Latchford, Hanham, and myself (all members of the O.N.F.C.) are the most complete, and I am sure that I am right in saying that these collections will all of them be freely placed at the service of students wishing to make use of them.

Now though much has been done towards ascertaining the species of mollusca occurring within our limits, and towards working out their distribution within our territory, and studying their habits and life histories, there is still much to be done before our knowledge of the Conchology of Canada can be considered at all satisfactory. The labourers in the field have been so few that there thousands of square miles of land and hundreds of miles of sea coast still wholly unexplored.

The deep seas of both the Atlantic and Pacific Coasts have as yet hardly been touched. The Nudibranchs of both the eastern and western seas have been almost wholly neglected. The land and freshwater shells of large tracts of our western and northern provinces are quite unknown. Even in those provinces that have been most thoroughly worked, *i.e.* Ontario and Quebec there are, I am confident, many dis-

coveries to be made, and of course in the less known districts in the northern and western portions of the Dominion there must be numbers of species which will one day be brought to light by the industrious naturalist. Moreover there are the life histories of the great majority of our species still to be worked out.

In many genera, too, the limits of variation of the various species have yet to be defined. I do not suppose that any two conchologists would be agreed as to the number of species, of such genera, for instance as *Limnæa* or *Planorbis* or *Sphærium* or *Pupa* or *Succinea* or *Bela* or *Macoma*, which should be entered upon our lists; and the same state of things obtains of course in many other genera.

Our first desideratum is I think a *larger number of observers*. The area to be examined is so extensive that, until in Canada we can count at least ten times as many conchologists as there are at present, we cannot hope to have the field properly covered.

Secondly, with a view to encourage or stimulate a rising generation of students, I think we ought to try and secure a more *complete National collection* of mollusca and their shells.

If proper space could be given at Ottawa to such a collection I am sure that it would be considered a pleasure and a privilege by Canadians to be allowed to make the collection as perfect as might be.

And thirdly, I think we need a *geographical catalogue* of the mollusca of Canada showing the distribution of the species as at present known. This might be on the same plan as Prof. Macoun's well known Catalogue of Plants, and I am sure that it would prove a very great help to collectors and students. Such a catalogue could, I should fancy, be prepared quite easily at the present time by the officers of the Geological and Natural History Survey from the data already in their possession.

And now in concluding this very hasty and imperfect survey of the subject, I will ask the members of the club to do what they can towards supplying the desiderata I have indicated.

Try to send a few more students into the field. Try to impress upon the officers of our National Museum the need of as complete a representation of the *recent*, as there is already of our *fossil*, conchological fauna, and if you agree with me that the time has come when our

shells should be catalogued as our beasts and birds and plants have already been, then try to persuade the Naturalists in charge of our public collections to undertake the work which I feel they will most readily do, if they think that such a course will help forward the study of Canadian conchology.

## APPENDIX.

A list of some of the most important papers relating to Canadian Conchology :

A. Papers referring more especially to eastern marine shells.

1. Stimpson, Wm.—Revision of the Synonymy of the Testaceous Mollusks of New England. Boston, 1851.
2. Stimpson, Wm.—Synopsis of the Marine Invertebrata of Grand Manan or the region about the mouth of the Bay of Fundy, New Brunswick.  
*Smithsonian Contributions*, Vol. vi., 1854.
3. Bell, Robert—On the Natural History of the Gulf of St. Lawrence, and the distribution of the Mollusca in Eastern Canada.  
*Canadian Naturalist*, Vol. iv., p. 197. June, 1859.
4. Gould, A. A.—Report on the Invertebrata of Massachusetts, comprising the Mollusca, Annelida and Radiata, &c. Cambridge, 1841.  
Second edition revised and enlarged by W. G. Binney. Boston, 1870.
5. Dawson, J. W.—Marine Invertebrates collected in Gaspé Bay, lat. 48°, 45' W.  
*Canadian Naturalist*, Vol. iii., No. 5, p. 329. October, 1858.
6. Carpenter, P. P.—Note on Mollusks and Radiates from Labrador.  
*Canadian Naturalist*, Vol. iv., No. 2. April, 1859.
7. Packard, A. S.—On the Marine Invertebrata of Southern Labrador.  
*Canadian Naturalist*, Vol. viii., No. 6. p. 401. December, 1863.

8. Stimpson, Wm.—Review of the Northern Buccineas, and remarks on some other Northern Marine Mollusks.  
*Canadian Naturalist*, Vol. ii, new series. October, 1865.
9. Whiteaves, J. F.—On the Marine Mollusca of Eastern Canada.  
*Canadian Naturalist*, Vol. iv., new series, p. 48-57. March, 1869.
- 9a. Whiteaves, J. F.—Lower Canadian Marine Mollusca.  
*Canadian Naturalist*, Vol. v., new series. July, 1870.
10. Whiteaves, J. F.—Report on Deep-Sea Dredging operations in the Gulf of St. Lawrence. (And two subsequent reports.)  
 Report to Minister of Marine and Fisheries. Ottawa, 1874. [Pamphlet.]
11. Whiteaves, J. F.—On recent Deep-Sea Dredging operations in the Gulf of St. Lawrence.  
*American Journal of Science*, 3rd series, Vol. vii., p. 210 &c. March, 1874.  
 Reprinted in *Canadian Naturalist*, new series, Vol. vii., p. 336. November, 1894.
12. Verrill, A. E.—Report upon the Invertebrate Animals of Vinyard Sound and the adjacent waters, &c.  
 In the Report of the U. S. Fish. Commission for 1871-2. Washington, 1873.
13. Verrill, A. E.—Results of recent Dredging Expeditions on the Coast of New England.  
*American Journal of Science*, 3rd series, Vol. v. January, 1873.
14. Verrill, A. E.—Notice of Recent Additions to the Marine Fauna of the Eastern Coast of North America.  
*American Journal of Science*, 3rd series, Vol. xvii. April, 1879.
15. Verrill, A. E.—Notice of Recent Additions to the Marine Invertebrata of the North-eastern Coast of America.  
 Proc. U. S. Nat. Museum, Vol. iii., p. 356. 1880.

- 16.—Verrill, A. E.—Notice of Recent Additions to the Marine Invertebrata of the North-Eastern Coast of America.  
Proc. N. S. Nat Museum, Vol. v., p. 315. 1882.
17. Verrill, A. E.—Catalogue of the Marine Mollusca added to the Fauna of the New England Region during the past ten years.  
Trans. Conn. Acad., Vol. v., p. 447. April-July, 1882.
18. Verrill, A. E.—The Cephalopods of the North-eastern Coast of America.  
Trans. Conn. Acad., Vol. v., June, 1880 and August, 1881.
19. Bell, Robert.—Report on Hudson's Bay, &c., &c.  
Appendix, "List of the Land, Freshwater and Marine Mollusca collected."  
Report of Prog. Geo. Surv. Canada, 1879-80.  
Montreal. 1881.
20. Bain, F.—The shells of Prince Edward Island.  
*Canadian Science Monthly*, March, 1885.
21. Ganong, W. F.—On the Zoology of the invertebrate animals of Passamaquoddy Bay.  
Bulletin of Nat. Hist. Soc. of New Brunswick, No. 5, pp. 87-97, 1885.
22. Ganong, W. F.—Notes on the Marine Invertebrates of L'Etang Harbour and the neighbouring waters.  
Bull. N. H. Soc. N.B., No. 5, pp. 34-36, 1885.
23. Ganong, W. F.—On the Marine Mollusca of New Brunswick with a list of species.  
Bull. N. H. Soc. N.B., No. 6, pp. 17-61, 1887.
24. Ganong, W. F.—The economic Mollusca of Acadia.  
Bull. N. H. Soc. N.B., No. 8, pp. 3-116, October, 1889.
25. Ganong, W. F.—Zoological Notes.  
Bull. N. H. Soc. N.B., No. 9, pp. 46-49, 1890.

26. Winkley, W. H.—Mollusca of the Oyster Beds of New Brunswick.  
Bull. N. H. Soc. N.B., No. 7, pp. 69-71, 1888.  
B. Papers referring to western marine shells.
  27. Carpenter, P. P.—The Mollusks of Western North America.  
Smithsonian Miscellaneous Collections 252.  
Washington, December, 1872.
  28. Lord, J. K.—The Naturalist in Vancouver's Island and British Columbia.  
In 2 Vols. London 1866.
  29. Whiteaves, J. F.—On some Marine Invertebrata from the west coast of North America.  
*Canadian Naturalist*, N.S., Vol. viii, December, 1878,
  30. Whiteaves, J. F.—On some Marine Invertebrata from the Queen Charlotte Islands.  
Report, Pro. Geo. Surv. Canada, 1878-79. Montreal, 1880.
  31. Whiteaves, J. F.—Some Marine Invertebrata collected by Dr. G. M. Dawson on the coast of British Columbia.  
Trans. Roy. Soc. Canada Vol. iv., sec. 4. 1886.
  32. Whiteaves, J. F.—Notes on some Marine Invertebrata from the coast of British Columbia.  
OTTAWA NATURALIST, Vol. vii, pp. 133-137. December, 1893.
  33. Newcombe, C. F.—Preliminary Check list ; Marine shells of British Columbia.  
Victoria 1893 (pamphlet.)
  34. Newcombe, C. F.—Report on the Marine shells of British Columbia.  
Bull. N. H. Soc. of Brit. Columbia, 1893, p. 31.
  35. Taylor, G. W.—Notes of a collecting trip to Departure Bay, Vancouver Island.  
*Nautilus* Vol. vii., p. 100. January 1894.
- C. Papers relating to the land and freshwater shells of Canada.

37. Sheppard, Mrs.—On the Recent shells which characterize Quebec and its environs.  
Trans. Lit. and Hist. Soc. Quebec Vol. iv, p. 188.  
1829.
38. Gould, A. A.—Catalogue of shells with descriptions of new species in Agassiz "Lake Superior."  
Boston 1850.
39. Binney, W. G.—Catalogue of land and freshwater univalve Mollusks collected in British America by Messrs Rose, Kennicott, and Drexler.  
Proc. Acad. Nat. Sci. Phila., 1861, p. 330.
40. Chapman, Ed. J.—Some notes on the drift deposits of western Canada and on the ancient extension of the Lake area of that region.  
*Canadian Journal*, 1861.
41. Chapman, Ed. J.—Additional note on the occurrence of freshwater shells in the upper drift deposits of western Canada.  
*Canadian Journal*, 1861.
42. Dawson, J. W.—On the newer Pliocene and Post Pliocene Deposits, of the vicinity of Montreal, with notices of Fossils recently discovered in them.  
*Canadian Naturalist*, Vol. ii., No. 6. December 1857.
43. Billings, E.—Notes on the Natural History of the Mountain of Montreal.  
*Canadian Naturalist*, Vol. ii., No. 2, p. 92. May 1857.
44. Anonymous.—Descriptions of some of the Freshwater Gasteropoda inhabiting the Lakes and Rivers of Canada.  
*Canadian Naturalist*, Vol. ii., p. 185. July 1857.
45. Dawson, J. W.—Additional Notes on the Post Pliocene Deposits of the St. Lawrence Valley.  
*Canadian Naturalist*, Vol. iv., No. 1 February 1859.

- 46.—Bell, Robert.—Notes on the Natural History of the Gulf of St. Lawrence and the distribution of the Mollusca of Eastern Canada.

*Canadian Naturalist*, Vol. iv., p. 197. 1859.

47. D'Urban, W. S. M.—Observations on the Natural History of the Valley of the River Rouge and surrounding Townships in the Counties of Argenteuil and Ottawa.

*Canadian Naturalist*, Vol. iv. 1859.

48. D'Urban, W.S.M.—Addenda to Natural History of the Valley of the River Rouge.

*Canadian Naturalist*, Vol. vi. 1861.

49. Bell, Robert.—On the occurrence of Freshwater Shells in some of our Post Tertiary deposits.

*Canadian Naturalist*, Vol. vi. 1861.

50. Bell, Robert.—List with notes of recent Land and Freshwater shells collected around Lakes Superior and Huron in 1859-60.

*Canadian Naturalist*, Vol. vi. 1861.

51. Whiteaves, J. F.—On the Land and Freshwater Mollusca of Lower Canada with thoughts on the general geographical distribution of animals and plants in Canada.

*Canadian Naturalist*, Vol. vi. 1861.

52. Whiteaves, J. F.—On the Land and Freshwater Mollusca of Lower Canada.

*Canadian Naturalist*, Vol. viii. February and April, 1863.

53. Whiteaves, J. F.—Lower Canadian Land and Freshwater Mollusca.

*Canadian Naturalist*, new series, Vol. v. July, 1870.

54. Bell, Robert.—On the Fauna of portions of the Lower St. Lawrence, the Saguenay, Lake St. John, etc.

Rept. Prog. Geo. Surv. Canada, 1857. Toronto, 1858.

55. Bell, Robert.—Catalogue of Animals and Plants collected by Mr. R. Bell on the South East side of the St. Lawrence, from Quebec and Gaspé.  
Rept. Prog. Geo. Surv. Canada. 1858. Montreal, 1859.
56. D'Urban, W. S. M.—Catalogue of animals collected by Mr. D'Urban in the Counties of Argenteuil and Ottawa.  
Rept. Prog. Geo. Surv. Canada, 1858. Montreal, 1859.
57. Bell, Robert.—List of Freshwater Mollusca from Manitoba and the Valley of the Nelson River.  
Rept. Prog. Geo. Surv. Canada, 1878-79. Montreal, 1880.
58. Bell, Robert.—See No. 19.
59. Dawson, Geo. M.—Report on the Geology and Resources of the region in vicinity of the Forty-ninth Parallel, *app. E*. Land and Freshwater Mollusca, collected during the summers of 1873-74 in the vicinity of the 49<sup>th</sup> par. Lake of the Woods to the Rocky Mountains. Montreal, 1885.
60. Heron, G. C.—On the Land and Freshwater Shells of the Ottawa. Trans. Ottawa F. N. Club, Vol. i., pt. 1, pp. 36-40. 1880.
61. Latchford, F. R.—Notes on the Ottawa Unionidæ. Trans. Ottawa F. N. Club, Vol. i., pt. 4, pp. 48-57. 1892.
62. Latchford, F. R.—Observations on the Terrestrial Mollusca of Ottawa and vicinity. Trans. Ottawa F. N. Club, Vol. ii., p. 211-231. 1885.
63. Taylor, Geo. W.—The Land Shells of Vancouver Island. OTTAWA NATURALIST, Vol. iii., p. 84-94. December, 1889.

64. Taylor and Latchford.—List of the Land and Freshwater Mollusca of Ottawa as recorded in the Transactions of the Ottawa Field-Naturalists' Club up to April 1, 1890.

OTTAWA NATURALIST, Vol. iv., p. 54-58. June, 1890.

65. Latchford, F. R.—Conchological Notes.

OTTAWA NATURALIST, Vol. vi., p. 118-119. November, 1892.

66. Taylor, G. W.—Preliminary Check List of the Land and Freshwater Mollusca of Canada.

OTTAWA NATURALIST, Vol. vi., p. 33-37. June, 1892.

67. Taylor, Geo. W.—Conchological Notes (Pupa Holzingeri).

OTTAWA NATURALIST, Vol. vii., p. 51. June, 1893.

68. Latchford, F. R.—Conchological Notes (H. rufescens, &c.)

OTTAWA NATURALIST, Vol. vii., p. 132. November, 1893.

69. Taylor, G. W.—A Planorbis new to the Ottawa List.

OTTAWA NATURALIST, Vol. viii., p. 161. January, 1894.

NOTE.—Nine reports of the Conchological Section of the Ottawa Field-Naturalists' Club have been published in the Transactions, Vol. i., p. 57 and 74; Vol. ii., p. 130, 263 and 350, and in the OTTAWA NATURALIST, Vol. i., p. 107; Vol. iii., p. 65; Vol. iv., p. 51 and Vol. viii., p. 97.

70. Latchford, F. R.—Shells of Anticosti.

*American Naturalist*, Vol. xviii., p. 1051-2. October, 1884.

71. Christy, R. M.—Notes on the Land and Freshwater Mollusca of Manitoba.

*Journal of Conchology*, Vol. iv., p. 339-349. July, 1885.

72. Taylor, John W.—Description of a New Species of Planorbis from Manitoba.

*Journal of Conchology*, Vol. iv., p. 351. July, 1885.

73. Provancher, L'Abbe L.—Les Mollusques de la Province de Quebec.  
Quebec, 1891.
74. Cockerell, T. D. A.—New Western Slugs.  
*Nautilus*, Vol. iii., pp. 111-113, February, 1890.
75. Cockerell, T. D. A.—The Slugs of British Columbia.  
*Nautilus*, Vol. v., pp. 30-32, July 1891.
76. Taylor, G. W.—Land shells of Vancouver Island.  
*Nautilus*, Vol. v., p. 91, December, 1891.
77. Taylor, G. W.—*Limax Agrestis*, Linn., on the Pacific coast.  
*Nautilus*, Vol. v., p. 92, December, 1891.
78. Nutting, C. C.—Report on Zoological explorations on the Lower  
Saskatchewan River.  
Bull. Labr. of Nat. Hist. of the State Univ. of Iowa.  
Vol. ii., No. 3., p. 235.
79. Hanham, A. W.—Land Mollusca observed in the Gaspé region.  
*Nautilus*, Vol. vii., p. 65, October, 1893.
80. Taylor, Geo. W.—Land and freshwater shells in the Rocky  
Mountains.  
*Nautilus*, Vol. vii., p. 85-86. December, 1893.

NOTE :—Dr. W. H. Dall's very useful pamphlet, "Instructions for collecting Mollusks and other [useful hints for the Conchologist" was published in 1892 as part G of Bulletin No. 39 of the U.S. National Museum. It should be in the hands of every one taking up the study of shells, and it contains in addition to full instructions for the collection and preservation of specimens, figures of the necessary apparatus and a list of the most useful text books &c.

## BOOK NOTICES.

"*The Lower Silurian Lamellibranchiata of Minnesota.*" By E. O. Ulrich. From Vol. III of the final report of the Geol. and Nat. Hist. Survey of Minnesota; pp. 475-628, June 16, 1894.

This interesting contribution to the palæontology of the Cambro-Silurian or Ordovician Rocks of Minnesota contains many things of interest to Canadian geologists. Several of the forms therein described or referred to, occur in Canada or are closely related to Canadian species, whilst the discussion of their generic relations is always a topic of special interest to all palæontologists. This memoir constitutes chapter VI of the third volume of the final report of the Minnesota Survey and opens out with a short excursus on the terminology used in the text. The following forms occur in Canada and are described in the text and figured under the following designations.

1. *Ambonychia bellistriata*, Hall.
2. " *amygdalina*, Hall.
3. *Byssonychia radiata*, Hall (sp.)  
(= *Ambonychia radiata* of authors.)
4. *Modiolopsis mytiloides*, Hall.
5. *Cyrtodonta rugosa*, Billings.
6. " *Canadensis*, Billings.
7. *Vanuxemia inconstans*, Billings.
8. *Matheria tenera*, Billings.
9. *Whitella Hindei*, Billings,  
(= *Cyrtodonta Hindei*, B.)
10. " *plebeia*, Billings.  
(= *Cyrtodonta plebeia*, B.)
11. *Ctenodonta nasuta*, Hall.
12. " " *var. robusta*, Ulrich.
13. " *gibberula*, Salter.
14. " *levata*, Hall.
15. " *Logani*, Salter.

GENUS WHITEAVESIA.—On page 513 of this memoir Prof. Ulrich proposes the genus *Actinomya* to receive a number of species heretofore classed under the general designation of *Modiolopsis*. The name

*Actinomya* was preoccupied by Meyer. On page 628 Mr. Ulrich says : —“ A new name is therefore necessary for the Silurian genus, and it gives me much pleasure to propose *Whiteavesia*, after Prof. J. F. Whiteaves the successful palæontologist to the Geological Survey of Canada. H. M. AMI.

WHITEAVES, J. F. —*Descriptions of two new species of Ammonites from the Cretaceous rocks of the Queen Charlotte Islands. Can. Rec. Sci. pp. 421-426, Pl. VII, figs. 1, 1 a, and 2, 2 a, and 2 b. Montreal, October, 1893.*

As the title indicates, Mr. Whiteaves here described two new species of Ammonites from British Columbia. The precise locality from which the specimens are said to have been collected is Skidegate Inlet, Q. C. I.

These specimens were communicated to Mr. Whiteaves, by Dr. C. F. Newcombe of Victoria, B.C., curator of the Natural History Society of British Columbia, but were collected at Skidegate by Mr. James Deans, formerly assistant to the late Mr. James Richardson of the Geological Survey of Canada, who visited those Islands in 1872.

The two species described by Mr. Whiteaves are as follows :—

Pl. VII, figs. 1, 1 a. *Olcostephanus* (*Astieria*) *Deansii* ; Pl. VII, figs. 2, 2 a, 2 b. *Hoplites* *Haidaguensis*. These two forms, which as Mr. Whiteaves says “are clearly referable to the family of Stephanoceratidæ of Neumayr,” are “nearly related” to two other forms from “the Neocomian of France” viz : *Olcostephanus Jeannotti* d’Orbigny, sp., and *Hoplites sinuosus*, d’Orbigny, sp., respectively. An excellent plate accompanies the paper, prepared by Mr. Laurence Lambe, and drawn on stone by Mr. O. E. Prudhomme.

H. M. AMI.

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NOTE.—Vol. VIII consists of 10 Nos., none having been issued in January and February.



## SUMMARY

— OF —

# Canadian Mining Regulations.

## NOTICE.

THE following is a summary of the Regulations with respect to the manner of recording claims for *Mineral Lands*, other than Coal Lands, and the conditions governing the purchase of the same.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting, for mineral deposits, with a view to obtaining a mining location for the same, but no mining location shall be granted until actual discovery has been made of the vein, lode or deposit of mineral or metal within the limits of the location of claim.

A location for mining, except for *Iron*, shall not be more than 1500 feet in length, nor more than 600 feet in breadth. A location for mining *Iron*, shall not exceed 160 acres in area.

On discovering a mineral deposit any person may obtain a mining location, upon marking out his location on the ground, in accordance with the regulations in that behalf, and filing with the Agent of Dominion Lands for the district, within sixty days from discovery, an affidavit in form prescribed by Mining Regulations, and paying at the same time an office fee of five dollars, which will entitle the person so recording his claim to enter into possession of the location applied for.

At any time before the expiration of five years from the date of recording his claim, the claimant may, upon filing proof with the Local Agent that he has expended \$500.00 in actual mining operations on the claim, by paying to the Local Agent therefor \$5 per acre cash and a further sum of \$50 to cover the cost of survey, obtain a patent for said claim as provided in the said Mining Regulations.

*Copies of the Regulations may be obtained upon application to the Department of the Interior.*

**A. M. BURGESS.**

Deputy of the Minister of the Interior

DEPARTMENT OF THE INTERIOR,  
Ottawa, Canada, December 1892.

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